

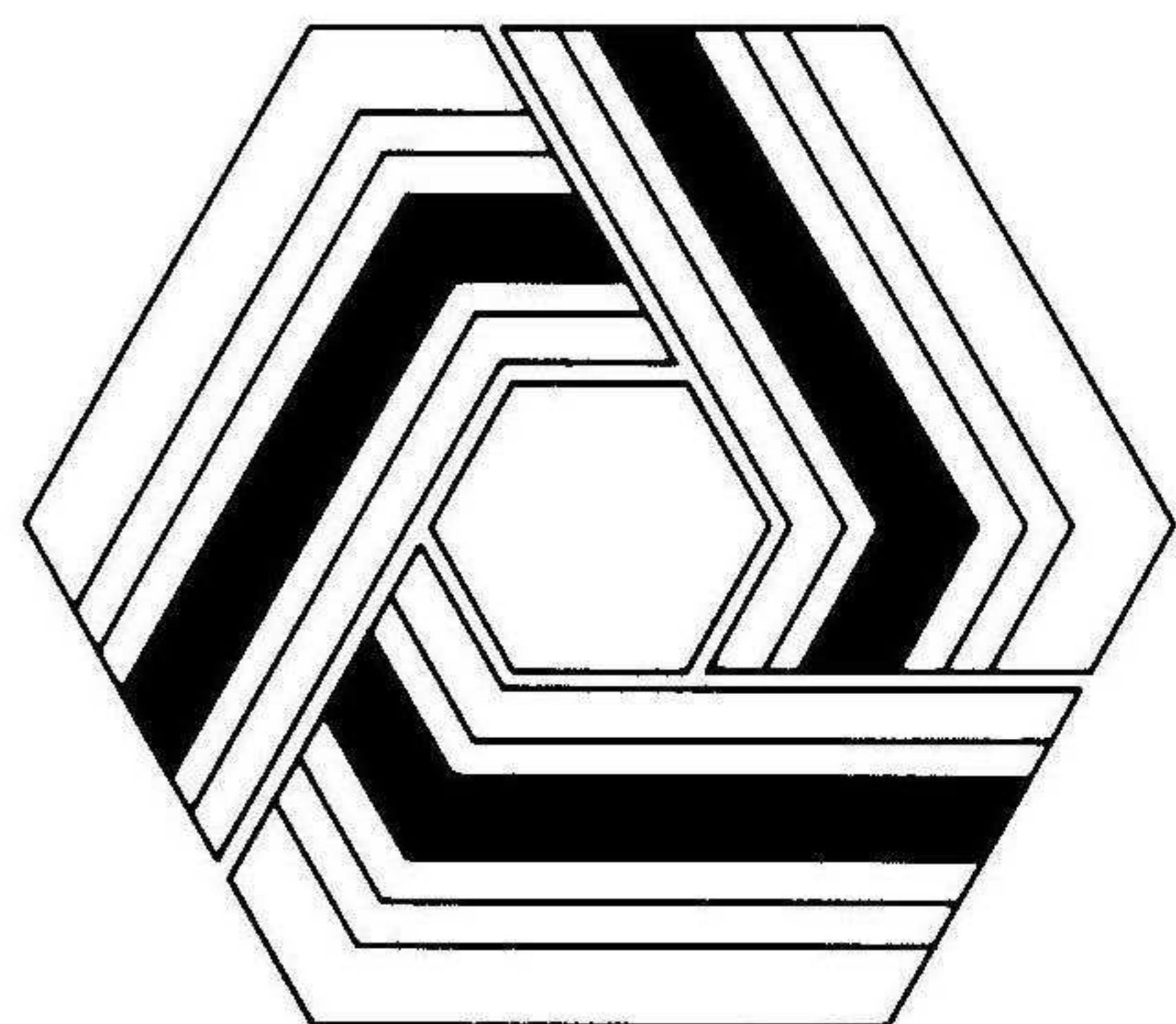
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VIGNETTES FROM

A CENTURY OF SERVICE

to the University, the State, and the Nation

1890 - 1990



DEPARTMENT OF
PHYSICS

University of Illinois
at Urbana-Champaign

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INTRODUCTION

This collection of centennial vignettes of the Department of Physics at the University of Illinois at Urbana-Champaign was undertaken as part of the Department's centennial celebration, a year-long affair that has been the occasion of a great deal of both reminiscence and anticipation. Looking into its past, the Department has searched its files and the University Archives for the pieces that, assembled together, have become this monograph; separately, these stories, photos, and records have been displayed on the second floor of Loomis Laboratory of Physics as "Little Known Facts" (LKFs) about Physics at Illinois. Vintage equipment from the last century of physics has been salvaged from laboratories and storerooms, lovingly renovated, and exhibited to the public in the first-floor lobby. Looking toward its future, the Physics Department sponsored a special centennial Colloquium series during 1990-1991, featuring presentations by some of its most eminent alumni and former faculty regarding the forefront of the profession and focusing attention on the relationship between physics and society. The centennial celebration's theme, "A Century of Service to the University, to the State, and to the Nation," emphasizes the contributions made by the Physics Department to the University of Illinois, to the science of physics, and to society in general. The logo used for the centennial can be seen on the cover of this retrospective.

The centennial celebration's theme of "service" draws attention to an aspect of physics not often considered by the general public--or even by physicists themselves. The modern university is frequently accused of being an ivory tower, where dusty scholars and scientists busily count angel-bedecked pins while the "real world" copes with the problems and challenges of life. Such critics cannot see that the various academic disciplines are part of a vibrant and interconnected community. Scholars do not shelter themselves from the "real world"; most of them are firmly and happily planted in it. The Department of Physics, far

from being isolated, has devoted itself to research, education, and participation in activities that link it closely to the university, the state, and the nation--indeed, to the entire world. By training future scientists, engineers, physicians, and architects in some of the fundamentals of their fields--by exposing future accountants, attorneys, farmers, and teachers to the importance of science--by discovering and encouraging promising minority and women undergraduates--by helping to teach the general public some of the scientific facts of environmentalism, arms control, and alternative energy sources--by working closely with other fields, from philosophy to astronomy, to develop interdisciplinary programs--the Department of Physics has consistently demonstrated its eagerness to act in the service of others.

This monograph was preceded by three other histories of the University of Illinois Department of Physics, all of which were invaluable in the preparation of the present work. They are Ira O. Baker and Everett E. King's *History of the College of Engineering at the University of Illinois*# (1945), Gerald M. Almy's *A Century of Physics at the University of Illinois** (1968; rev. 1975), and David Lazarus's *The Loomis Legacy** (1987). The primary documents, upon which this history draws heavily, were culled from the files of the Department of Physics; these files are presently being prepared for deposit in the University of Illinois Archives. A number of collections now held at the University Archives--in particular, the Francis Wheeler Loomis Papers, the Donald W. Kerst Papers, and the Albert P. Carman Papers--provided a wealth of information. The reader's attention should also be drawn to the photographs inserted in the booklet and the appendices, for additional information about the Department's history that could not be included in the body of the text.

Of course, the present work was not done by one person. Much of the preliminary research--as well as the basic structure of the project--was prepared by Terry Heiner, like the author a graduate student in history at the University of Illinois; it was she who first pointed out the most fascinating or amusing episodes in the Department's history. Robert Dunkelberger, a graduate student in library science at UIUC, prepared the LKF's displays and spent many hours immersed in the Annual Reports, assembling the data for the illustrations. William R. Magro, a

graduate student in physics at Illinois, patiently acted as interpreter of some of the more cryptic scientific concepts, supplied convenient word-processing facilities, and offered helpful criticisms of the manuscript. Robert W. Williams and Rebecca McDuffee, both in the Physics Department Publications Office, answered countless questions and provided much valuable advice. Steven M. Keen and Raymond F. Borelli of the Department's Business Office were wonderfully tolerant of the inevitable delays in the project, and wonderfully flexible in their expectations. Helpful suggestions and corrections were generously provided by a number of physics faculty. Any embarrassing errors that remain are all my own.

Lisa Warne⁺
Urbana, Illinois
June, 1991

#Copy on reserve in the College of Engineering.

*Copies available upon request from the Department of Physics.

⁺Lisa Warne was hired by the University of Illinois Department of Physics for the express purpose of writing these vignettes.

I. **"A more thorough cultivation of the fundamental sciences..."**

In 1867, while the nation still nursed the wounds inflicted by the Civil War, the University of Illinois was founded on a windswept prairie 130 miles south of Chicago. It was one of the three dozen or so land-grant colleges established under the Morrill Act of 1862, which endowed each state with 30,000 acres of land for every legislator it sent to Washington in 1860. The University's beginnings were inauspicious: the bleak landscape, where "neither trees, nor hills, nor water relieved the monotony,"¹ was home to a mere fifty students and four faculty members. Classes were concentrated in an enormous brick building known as the "Elephant," the erstwhile location of a short-lived seminary called the Urbana-Champaign Institute. In the winter, the dirt roads turned to an impassable mire; in the summer, local cows wandered onto the lawns to graze. There was little to indicate the birth of one of the finest universities in the nation.

Founded as an industrial and agricultural college, the University of Illinois began instruction in engineering almost immediately. Facilities for the Engineering College were sparse: classes were relegated to a former mule stable until 1871, when the College moved into a building on the southeast corner of Burrill and Springfield Avenues. Instruction was vastly different in the late nineteenth century: experimental work for engineering students was rare, for the profession was considered as much a craft as a science, and the student's training emphasized such manual skills as drafting, metalworking, and glassblowing. Learning in all subjects meant mostly memorization, and students attended regular quiz or recitation sessions to demonstrate their familiarity with the textbooks. The 1891-1892 University Catalogue stated, "To arouse and awaken the enthusiasm of the

student, occasional or stated lectures are necessary, and these are fully illustrated by sketches, diagrams, drawings, and photographs."²

All engineering students were required to take a course in physics during their third year of studies. To teach this course, the University hired Stillman Williams Robinson, Professor of Mechanical Science and Engineering, in 1870. Upon his arrival, Professor Robinson announced that "his aim was to qualify men to design, construct, and superintend machinery." In addition to a program of instruction in physics, math, chemistry, mechanics, drawing, and the liberal arts, Robinson required engineering students to work in the newly-designed machine shop. The shop made instructional apparatus to sell and to use in the University, but its principal purpose was to teach. At the time, only two other universities--the Stevens Institute of Technology and Boston (later Massachusetts) Institute of Technology--required any laboratory work for their engineers. Robinson, using Silliman's *Physics* for a textbook, also taught lecture and demonstration courses, for as many as six hours a day.³

In 1872, construction was begun on University Hall, a four-story brick leviathan that would for years be the symbol of the University of Illinois. By 1873, the Departments of Physics and Chemistry shared a lecture room and laboratory on the second floor of the building. In addition, rhetoric, mathematics, languages, home economics, and engineering were taught in the big structure. University Hall was the center of the campus, yet it was destined to be outgrown: within six years, the Chemistry Department would have its own building next door, and within twenty-two years, the entire Engineering College would relocate. For the time being, however, students could walk from one class to another in a few moments, and everyone knew everyone else by name.

Stillman Robinson left Illinois in 1877 to take a higher-paying position at the Ohio State University. His successor, Selim Hobart Peabody, bore even heavier responsibilities than Robinson did, for within three years of coming to Urbana, Peabody was named Regent. He continued to teach, leading classes in physics, mechanical engineering, psychology, logic, and political economy, but his duties as Regent were no lighter. Alone in his office, without clerical or administrative

help, Peabody handled course registration, the recording of grades, and letter writing, all by hand. He also made great strides in enlarging both the faculty and the financial resources of the University, nearly doubling the latter during his term. He was not always a popular leader--he banned dancing in the 1880s, for example, and continued to enforce mandatory, daily chapel long after students came to regard it as a nuisance and a bore--but he was certainly a vital and concerned leader.⁴

Peabody managed to shoulder these burdens until 1886, when physics instruction was assumed by Theodore B. Comstock. Comstock's tenure was brief and without significant developments, although he did initiate the division of the physics course into two separate sections, one for engineers and one for other students. In the fall of 1889 Comstock mysteriously failed to reappear on campus after the summer vacation--an unfortunate bit of bad timing, for physics was about to be formed into a separate department, and young Comstock would have been its first Head. That honor was given to a youthful Illinois graduate, Samuel Wesley Stratton, who was hastily appointed to replace the errant Comstock.

Professor Stratton oversaw the birth of the Department of Physics on September 17, 1890, when the University opened for the fall term. Stratton, who was only twenty-eight when he assumed his duties, had already taught mathematics and architecture at Illinois. His new responsibilities earned him rapid promotion: though only an "assistant" in 1889, he was a full professor by 1891. His particular contribution was the introduction of seven electrical engineering courses into the physics curriculum, including "Primary and Secondary Batteries," photometry, and "Installation of Light and Power Plants." Stratton also established a small electrical engineering laboratory in a room under the chapel in University Hall. His own research, described by one biographer as "nothing too outstanding," was in the area of heliostats and "the collection of orifices for the study of liquid flow."⁵

Even after its formation into a separate department, Physics' principal duty was to prepare students for careers in engineering and other disciplines. In this way, the Department served the University's emphasis on industrial and agricultural education. Over the next century, even after it began granting undergraduate and graduate degrees

of its own, the Physics Department would maintain its role in providing a solid basis in the principles of science to a wide variety of students. As the years passed, many new fields--such as biochemistry, computer science, dairy technology, forestry, and soil science--would make instruction in physics a prerequisite for their degrees. Consequently, as the table below demonstrates, the number of students receiving undergraduate degrees requiring physics--and therefore the teaching load of the department--would increase rapidly.

Number of University of Illinois Students Receiving
Undergraduate Degrees Requiring Physics

Year	Total Number of Degrees	Number of Degrees from College of Engineering
1890-91	28	22
1900-01	63	43
1910-11	226	202
1920-21	191	149
1930-31	355	293
1940-41	492	321
1950-51	1201	849
1960-61	1018	770
1970-71	970	681
1980-81	1649	1370
1989-90	1518	1305

Like Stillman Robinson before him, Samuel Wesley Stratton was eventually lured from Urbana by a higher-paying job, this time at the University of Chicago. He went on to become the first Director of the National Bureau of Standards, and later was President of the Massachusetts Institute of Technology. He died on October 18, 1931, while dictating an obituary for Thomas Alva Edison, who himself had died only hours before.

Stratton's importance to the University was such that, when he left in 1892, he was replaced by two men in physics and one in

electrical engineering. The new Head was Daniel William Shea, the best-educated of the early physics instructors. Shea earned his A.B. and A.M. degrees at Harvard and a PhD from Freiderich Wilhelms Universitat in Berlin. He stayed in Urbana-Champaign only four years, leaving in 1896 to go to the Catholic University of America, but did manage during his brief Headship to oversee the Physics Department's move out of University Hall.

Conditions in the largest building on campus had become increasingly crowded and very noisy. Professor Ira Baker of Civil Engineering had established the country's first concrete-testing laboratory at the University and was busily smashing up concrete blocks and cemented joints in his rooms on the first floor. One can only imagine the delight of engineering and humanities students alike when, in November 1894, Engineering Hall was completed and the entire College moved out of University Hall.⁶

Physics and Electrical Engineering occupied the top three floors in the north wing of the new building (although a number of laboratories were retained in University Hall until the autumn of 1898). In the Department's new quarters, a 200-seat amphitheater boasted "very complete" facilities for lectures and demonstrations, including "gas, water, steam and electricity." "The curtains of the room are controlled by means of an electric motor," reported the 1895 *Technograph*, "so that the room can be easily and quickly darkened." There were also a constant temperature room, a general laboratory, and a fully-equipped dynamo laboratory. The young department was now well-provided to pursue its stated purpose: "to give such a knowledge of the more important laws and phenomena of physical science as to enable the student to profitably pursue his subsequent technical studies."⁷

After Daniel Shea's resignation in November 1895, Electrical Engineering briefly enjoyed the status of a separate department. Fred A. Sager took charge of physics work and Bernard V. Swenson headed EE. The departments were reunited in September 1896, when Albert Pruden Carman began his long tenure as Head of the Physics Department. For more than thirty years, Carman oversaw a period in the Department's history that was marked by a gradual increase in the number of faculty and graduate students, as well as by a reluctance to abandon outmoded

scientific paradigms. Carman's tenure as Head ran until 1929, and so encompassed some of the great revolutions in physics that took place in the early part of this century. Yet the new ideas were, for the most part, not readily absorbed at the University of Illinois. This was partly a matter of timing: although Carman hired five new physicists before 1909, enrollments in the 'teens and 'twenties did not justify expanding the faculty and thus the infusion of fresh, new blood into the Department was blocked.

The group of five men hired between 1901 and 1909 was quite young (their ages ranged from twenty-seven to thirty-four), yet all had been "educated predominantly in the pre-quantum (and even pre-relativity) school, and were very much part of the 'establishment'." Locked into their classical training, the group ignored or derided the work of Einstein, Bohr, and Rutherford, and no instructor or graduate student from this period "seems to have had a major subsequent influence on the progress of physics in the world."⁸

Yet Illinois' Physics Department did make important scientific contributions in its early days. Dr. Floyd Rowe Watson, a specialist in the acoustics of buildings, became quite an authority on the subject between 1909, when he was asked to correct the acoustics of the University Auditorium (now Foellinger Auditorium), and 1940, when he retired. Describing his work in 1933, he wrote:

The investigations may be considered as one-half pure research and one-half practical applications in buildings in the acoustic adjustment of rooms, in the construction of sound-proof walls and floors, and in reducing the vibrational disturbance of machines.⁹

Watson was editor of the *Journal of the Acoustical Society of America*, and in 1939 became President of the Society. He remained active after his retirement, soundproofing the new Pentagon building for the War Department in Washington, D. C., during World War II and designing the acoustics for the Beckman Auditorium at the University of California at Berkeley. Professor Watson died in 1974 at the age of 101.¹⁰

The epitome of the stubborn, eccentric scientist must have been Jakob Kunz, a Swiss physicist who was "clearly the intellectual leader of the department" and who alone advised half the PhD theses awarded by 1929. In 1914 he published an article attempting to refute the theory of quantum mechanics; by 1917, however, he had made his peace with the modern physics and based his subsequent work using photoelectric cells upon it. Kunz's cell was exceptionally sensitive and "fatigue-proof," two improvements over its predecessors. The patented cell was introduced into industry and its manufacture became a considerable business; the cells were used "for the reproduction of sound in talking pictures, for the reproduction of images in television, for the selection of minerals, papers, cigars, ball bearings,...and for many other applications." Kunz, who died in 1938, left a mixed impression upon his colleagues. Gerald M. Almy remembered him as "a very human and engaging scientist," while Francis Wheeler Loomis was rather more acerbic. In 1973, Loomis wrote of Kunz, "If people had taken him seriously he could have done a great deal of harm but no one did except the old department at Urbana, Illinois."¹¹

Charles Tobias Knipp, who came to Illinois from Indiana University in 1903, did important work in the development of alkali vapor detector tubes. Dr. Knipp and Professor H. A. Brown of Electrical Engineering invented a tube for radio purposes "which reduces the 'B' battery necessary from 21.5 volts to about 7 volts by the introduction of a potassium-sodium alloy into the tube." These tubes, patented by Knipp and Brown, were manufactured by the General Electric Company. Knipp also took an active role in bringing physics to the general public, as we shall see below.¹²

Although the Department was slow in modernizing its approach to physics, the curriculum was developing. In the spring of 1906, courses were offered in mathematical approaches to thermodynamics, mathematical physics, and the theoretical study of light. Classes in the teaching of physics were also introduced that year.¹³

On March 31, 1906, the College of Science sponsored a public reception with exhibits of apparatus and experiments. Hosted by Dean Edgar J. Townsend, the attractions included a mercury vapor lamp and a radium spectroscopy display. Following suit a few months later, on

August 6, 1906, Professor Charles Knipp organized the first Physics Department exhibition, a public show that was to become the model for subsequent engineering open houses. "Those of us who knew Professor Knipp," reminisced the Department newsletter almost fifty years later, "remember that he was never so happy as when he was planning a Physics Show." The 1906 show included displays on "light, sound, wireless telegraphy and other electrical operations, which were accompanied by lectures that described to the guests the principles and mechanisms involved."¹⁴

After 1906, other departments in the College of Engineering began to host public exhibits. The annual Electrical Show, an increasingly elaborate affair that by 1913 drew over 3,000 visitors, was only the most visible. The 1919 Physics Open House, for example, had seventeen exhibits, including "Aurora Borealis," "X-ray," "Lissajou's Apparatus," and the intriguing "Library and Department Office." In 1920, the various departments of the College of Engineering combined to host the first all-engineering Open House. A particular purpose of the Open House was to involve engineering students in the planning and staging of the demonstrations; in 1936, the name was changed to the Illinois Student Engineering Exhibit to reflect this goal. Although the Electrical Show had continued in addition to the all-engineering show, both exhibits were discontinued in 1941 due to the war. In 1948, the Engineering Open House was revived. Physics displays from this period included the 300 MeV betatron, "Inside a Television Tube," and a mercury hammer made with liquid nitrogen. Since 1948, the E.O.H. has grown steadily more popular, now drawing approximately 20,000 visitors every year.¹⁵

Beginning in 1902, Professor Carman began to sound a refrain that would become familiar to subsequent Department Heads. Only four years after moving into its new quarters in Engineering Hall, the Physics Department found itself short of space. In 1903 Carman wrote to N. C. Ricker, Dean of the College of Engineering, that the Department needed a large lecture room and two or three small classrooms. "Our present lecture room has 180 seats," he wrote. "This year's class has filled every seat and next year's class will number over 200." He pointed out that many American universities were erecting buildings just for

physics, at costs ranging from \$100,000 to \$250,000. He hinted that this might be a good idea for Illinois, too, for "the state cannot afford to put up an inferior laboratory for such an important department of science as that of physics."¹⁶

In 1904, Carman repeated his plea. Enrollments in physics courses had increased more rapidly than expected: in the 1896-1897 school year, 112 students had taken physics, but in the 1904-1905 year, almost 400 had enrolled. Carman asked for at least \$100,000 for a new laboratory.¹⁷

Professor Carman had to wait another three years for his wish to be granted, but it was worthwhile, for the 1907 Illinois General Assembly appropriated \$250,000 for the new building. Competition no doubt had much to do with this generosity--advocates of expenditures in the sciences never failed to point out that Cornell, Indiana, and Wisconsin had new physics buildings, or that Germany and Great Britain had better-trained physicists. "In every great technical and scientific school there must be a generous physical laboratory," wrote Professor Carman in the *Illini*.¹⁸

The Physics Department established itself as an important presence on the Illinois campus in September 1909, when the new Physics Laboratory opened on the northwest corner of Green and Matthews Streets. The "dignified and beautiful" laboratory "fixes a high grade for our future buildings," wrote Professor Carman in the 1909 *Technograph*--it was fireproof, for one thing. The dedication ceremonies for the new building were held on November 27. Carman may not have done much to force the University of Illinois Physics Department into twentieth-century physics, but he must be credited for his persistent efforts to obtain a large, modern building to house the Department. The new Physics Laboratory, incidentally, was completed \$30,000 under budget, an unlikely accomplishment in any era.¹⁹

In June 1910, the Department had further cause for pride. The first doctoral degree in physics at Illinois was awarded to Edward Beattie Stephenson, whose thesis, "Magnetic Properties of Heusler Alloys," was advised by Professor Knipp. Stephenson then left Illinois to teach physics at the University of North Dakota. The second PhD was awarded soon after to Elmer Howard Williams, whose thesis, "The Nature

of Spark Discharges at Very Small Distances," was advised by Professor Jakob Kunz. Both papers were published in the *Physical Review* of September 1910. E. H. Williams, who had come to Illinois as an instructor in 1907, remained in the Department until his retirement in 1947 and died in Urbana in 1951. His colleagues remembered him for "his unassuming genuineness and dependability as a friend, as a citizen, and as a teacher."²⁰

Another permanent fixture of the Department arrived in 1912 in the person of Della Mae Rogers, who became its first secretary and librarian. The historian should be especially grateful to Della Mae Rogers for the charming and detailed newsletters she wrote annually from 1945 to 1959. Like E. H. Williams, Rogers (later McCown) remained with Physics for virtually her entire career, heading the secretarial staff until her retirement in 1959. In all, she had served the University for fifty years. She died in 1975.

The gradual growth of the Physics Department--and of the entire University--was temporarily halted with the onset of the First World War. In the summer of 1914, fighting broke out in Europe. The Physics Department felt the effects of the war as early as 1916, when shipments of supplies and equipment were cut off by submarine warfare. The price of imported equipment skyrocketed; some items cost as much as twice the peacetime price. "In the end this present embarrassment will turn to the advantage of American science, for it is leading to the manufacture of much material in this country," the 1916 *Annual Report* said philosophically, "but it is now greatly increasing our own expenses."²¹

Though the United States had vowed to remain uninvolved in the war, the entire country began a "preparedness" program that belied its neutral status. Preparedness reached the isolated plains of the University of Illinois, too. When President Woodrow Wilson asked Congress for a declaration of war against Germany on April 2, 1917, the campus was ready to respond. Over 3,400 men enrolled in the Students' Army Training Corps; campus women led "liberty loan" and relief fund drives that raised \$750,000; and many faculty members left Urbana to contribute to war research.²²

In the meantime, it was hardly business as usual in Urbana-Champaign. Registration in physics classes declined sharply, causing

Professor E. H. Williams to complain, "My courses have suffered greatly due to students dropping out for military service or other service in the national defense. Not only has this affected the size of the classes but the efficiency of those remaining have [sic] been impaired." Enrollment in physics courses decreased to anywhere from 20% to 70% of the previous year's enrollments, leaving behind those who would not or could not enlist--perhaps because they were of the wrong sex. "We find that there is an increasing demand for women" as high school teachers and research assistants, reported the 1918 Annual Report. "After these fields are once really opened to the women there is likely to be an increased number of them wanting courses in our university laboratories." Moreover, if the war should last much longer, "the continuance of the industries will depend upon women trained in the physical sciences." Traditionalists needn't have worried, however, for the numbers of women enrolled in physics classes never skyrocketed. Indeed, until 1945 only one woman, Eleanor Frances Seiler in 1922, earned a PhD in physics from the University of Illinois. (The first woman to earn an MA in physics was Nellie Nancy Hornor, in 1913; the first MS went to Sister Mary Huberta McCarthy, in 1933. The first woman to earn an undergraduate degree in physics at Illinois was Beryl Love Bristow, who received an AB in 1918.)²³

By the time the Armistice was declared on November 11, 1918, 181 young University of Illinois men had given their lives to the war. Some of them died, not of battle wounds, but of the terrible influenza epidemic that swept the United States and Europe in 1918. On campus, the new women's dormitory was quickly converted to an emergency hospital for flu patients. Two of the physics staff died of influenza: Assistant Carl Eli Pike in Urbana and Mechanician Harold C. Buchanan in Germany.²⁴

Though World War I disrupted life in the Physics Department, some achievements remained possible. In June 1917, an undergraduate curriculum in General Engineering Physics was created, although no one enrolled. Professor Carman remained optimistic, believing that the war would demonstrate the value of trained physicists to government, industry, and scholarship. "The war showed many cases where the nation found our university laboratories an invaluable resource," he wrote in the 1920 Annual Report. "These emergencies exist in times of commercial

war as well as in times of military conflict," and University of Illinois would be ready to provide the ammunition. In 1923, the first bachelor of science degree in Engineering Physics was awarded to Wallace Waterfall, who would serve as secretary of the American Institute of Physics from 1945 to 1974, the year of his death.²⁵

The 1920s were a peaceful decade in the Department of Physics. The number of graduate students and teaching assistants grew slowly--though there was always a need for more--so that by 1929, only thirty-six PhDs had been awarded. One new faculty member, Dr. R. F. Paton, was added in 1922. Professor Carman began the Physics Colloquium, an institution that continues to this day; in the 1920s it was held on Thursday evenings at 7:15. Della Mae McCown remembered that "the wives would assemble at one of the homes with their mending," and at 9:00 the men would join them for refreshments. The Department was small, intimate, and familial, yet rather parochial. When Professor Carman retired in September 1929, his colleagues presented him with a testimonial that read, "Great material results have been brought about through your initiative, your wise judgment, and your ability for organization; but highly as we value these we appreciate even more the friendly advice and unselfish interest that you have given us in our work." The University's President, David Kinley, remarked that Professor Carman's work was both silent and steady--admirable qualities, though neither could be said to characterize the work of his successor.²⁶

II. "...research is an indispensable accompaniment of good teaching..."

A small revolution took place at the University of Illinois in 1929, when Francis Wheeler Loomis assumed the Headship of the Physics Department. A dynamic, opinionated, energetic man who inspired tremendous admiration in his colleagues, Loomis came to Illinois because it was a place where he could leave his mark. Initially unimpressed with the quality of the Department and suffering from an easterner's contempt of the rural Midwest, Loomis nevertheless saw potential in the modest young university. He turned down a generous offer from New York University and moved his family to Urbana, where he molded a mediocre department into a first-class research and teaching institution.

Among Loomis's first acts was the expansion of the Department's faculty and research areas. "I came here knowing...that the department here was obsolete," he said in 1965, "and the only way to get it over being obsolete was to get some new people." Before the Depression slashed the Department's budget, Loomis hired four new professors in 1930 and 1931: James H. Bartlett, a Harvard PhD, and Harold Mott-Smith, an Illinois graduate, came as theorists trained in quantum mechanics; Gerald M. Almy, another Harvard PhD, and P. Gerald Kruger from Cornell were experimentalists in molecular spectroscopy, Loomis's own field.²⁷

Loomis no doubt was frustrated by the financial crisis brought on by the Depression, but he made do, occasionally purchasing used equipment from other universities or delaying research projects until better times. Loomis also set about dragging the Department into the twentieth century, "stimulating the interest of staff and students and directing it towards the more vital parts of modern physics." He instituted seminars in wave mechanics and theoretical physics; he made the colloquium topics more technical and discouraged non-physicists from

attending; and he instituted graduate courses in modern theoretical physics. His frustration at the often-primitive conditions occasionally made itself felt. In the 1931 Annual Report he complained that the Physics Laboratory shook so badly at times as to disrupt spectrograph measurements, and the fact that Green Street was still cobblestoned didn't help. "Our vibration problems would be reduced considerably if a concrete pavement could be put in on Green Street," he wrote. "We can feel the whole building shake every time a buss [sic] or a big coal truck goes over one of the many big bumps in front of our building." Professor Loomis continued to make this complaint annually until 1941, when apparently the street was paved.²⁸

The Depression years, from 1929 to about 1938, hit the University of Illinois hard, as they did most colleges and universities in the country. The Department of Physics was able to continue its teaching and research, though its budget was reduced by 40%, and to expand somewhat the numbers of its faculty and graduate students. In 1932, Floyd Watson won the Department's first research grant when the U.S. Gypsum Company awarded him \$1000 to study the effects of sound waves on materials. Other researchers adapted to the Depression by working with old and dilapidated equipment and waiting longer for supplies and apparatus. The worst years were endured by conserving the supplies that had been purchased in more prosperous times.

As the nation began to edge its way out of the Depression, physics at the University of Illinois took another giant step forward into the atomic age. In 1935, Professor P. Gerald Kruger and his student G. Kenneth Green constructed a 1 MeV deuteron cyclotron at the University of Illinois. This was the nation's third such machine. Kruger and Green were assisted by Professor Paton, who used the new Geiger counter technique "in the detection side of the problem," and by Professor Mott-Smith, who worked on the ion source. "It is a good thing for the department to have work in nuclear physics," wrote Loomis, "since this is at present one of the most active and fruitful fields in the whole of physics." Five years later, a 32 MeV proton cyclotron was designed at Illinois and housed in a garage acquired by the Physics Department in 1930, just south of the Boneyard Creek.²⁹

By 1937, Loomis was able to begin rebuilding his Department. Space had become a problem again, especially as the Physics Laboratory was not suitable for more modern research, but the Trustees would repeatedly deny requests for an addition to the building. Loomis had more luck in hiring new staff members. His strategy--upon learning that Illinois lacked the ambience, money, and prestige to attract scientists at the peak of their careers--was to hire promising young men and nurture them into productivity. Between 1937 and 1941, Loomis hired twelve new physicists, including Maurice Goldhaber, John Henry Manley, Leland J. Haworth, Ernest M. Lyman, and Robert Serber. Loomis's enthusiastic spending inspired a colleague of his to compose the following in 1941:

There was a young fellow named Wheeler,
Who for more men put out a feeler.
Many men did he hire
And none did he fire,
But spent cash like a drunken New Dealer.³⁰

The next step in the blossoming high-energy physics program came in September 1938, when Professor Donald W. Kerst accepted a position at the University of Illinois. Kerst had been working on plans for an electron accelerator while at the General Electric X-ray Corporation, but received little support there for a project that seemed to have only a remote chance of succeeding. The Physics Department was cautious, too. "He and all of us realize that it is a very long shot to hope that this device will be successful since it is so original and so different from anything previously attempted," wrote Loomis. But Kerst was definitely the one for the job. When a reporter once asked him what his hobbies were, he replied, "High voltage has been a hobby of mine since grade school days, when the Ford spark coil furnished the high voltage."³¹

Kerst spent the fall of 1938 working with Professors Serber and Mott-Smith on the theoretical basis for his machine. On October 5 he

requested, and received, \$400 from the University Research Board to construct the accelerator. On July 15, 1940, seventeen months after the grant was made, Kerst's 2 MeV accelerator worked for the first time. He had created what scientists around the world had been working to build: a machine that could produce high-energy electrons. His barely-contained excitement is evident in a letter he wrote on July 17: "In the last couple of days a device, which has been designed and built in our Physics Department, has begun to operate, and it shows signs of possible commercial development....Since the success of this device is of immediate interest to the scientific world, I should like to publish my results as soon as possible."³² The original machine is part of the permanent collection of the Smithsonian Institution in Washington, D.C.

Later that year, Professor Kerst took a leave of absence from the University and went to the General Electric Laboratories, where he had been promised assistance and support in the construction of a more powerful machine. In his absence, the Department continued to plan for the future of the accelerator's research program, hoping someday to construct a 100 MeV machine. In the summer of 1941, \$30,000 was allocated for a building and staff for the accelerator. That same summer, Kerst's 20 MeV machine began working at General Electric. He named it the "rheotron," meaning "flux-tron," and promptly offered it to the government for defense work, thinking that its ability to produce high-quality x-rays of dense metals would be useful in the production of armaments. Kerst's intention was to do such work with the 20 MeV accelerator at Illinois, where he could test "carriages for heavy guns, cast armor, rudder posts, hull castings, steam valves, turret faces, and ingots."³³

In December 1941, Kerst changed the name of the machine to the better-known "Betatron." The 20 MeV model that had been constructed at General Electric was shipped to the University of Illinois on December 24, 1941. It was about five feet long, six feet high, and three feet wide, and weighed four tons. The Betatron was installed and operating in the University's Abbott Power Plant (renamed the Betatron Laboratory) by February 24, 1942. Some defense work was undertaken by Kerst and his students almost immediately, though Kerst himself left Urbana for the atomic bomb project at Los Alamos, New Mexico, in November 1943.

Kerst's absence was part of a general disruption of the faculty during World War II. As early as 1940, three Illinois faculty members--Lyman, Ramsey, and Kanner--had taken leaves of absence to go to the Radiation Laboratory at Massachusetts Institute of Technology. The Illinois contingent won high praise from its "Rad Lab" colleagues. I. I. Rabi wrote to Loomis, "Your boys are doing splendidly and are probably the most solid citizens of the whole younger crowd....They are really too valuable to release." But Rabi and the project's director, Lee A. DuBridge, wanted more. "I have a particular feeling that you could be of unusual assistance to me," wrote DuBridge to Loomis. "If you could possibly arrange to come...you would be of tremendous value to the project." In January 1941, eleven months before the United States entered the war, Loomis himself joined the Rad Lab, leaving the department in the capable hands of Professor P. G. Kruger.³⁴

On December 7, 1941, the "day that will live in infamy," the Japanese Air Force bombed the U.S. Naval Base at Pearl Harbor. The next day, the United States declared war on Japan and, three days after that, found itself at war with Germany and Italy. The Second World War had a far more unsettling effect on the Physics Department than World War I did; in all, over fifty faculty members took leaves of absence to work in war research, and many graduate students were either drafted or took time off from their studies to join various defense projects. After the war, many of these researchers did not return to Illinois, since they assumed positions elsewhere.

On campus, the Physics Department was caught between two trends: as teachers departed, the number of students in physics courses actually increased, to a peak enrollment of 2600 in 1943. The bulk of these new arrivals were military students, enrolled in the training programs established by the armed forces on the Illinois campus. The students in the Naval Training School, the Navy V-12 Program, and the Army Specialized Training, Assignment, and Reclassification Center (STAR) needed quick refresher courses in physics, mathematics, and chemistry; in order to handle the skyrocketing enrollments, faculty members drawn from such varied fields as music, architecture, agriculture, and biology brushed up on their physics and taught the soldiers. Wives of faculty

members, too, many of whom had been physics students themselves, helped with the teaching load.³⁵

Much of the mood and bustle of the "home front" in World War II is captured in the Physics Department newsletters from those years. Begun in 1940 by Wheeler Loomis as a way of keeping in touch with faculty members away doing war research, the newsletters were continued until 1959 by P. Gerald Kruger and then Della Mae Rogers McCown. In 1941 Robert Serber's wife, Charlotte, added a "scandal sheet" that proves even physicists know how to party. One night in January 1941, a group of professors and graduate students stayed late in the Physics Laboratory to grade exams. "Everybody was busy and working hard," said the newsletter. "Someone got thirsty. Sometwo likewise. So [Dr. J. W.] Coltman went out and got a case of beer....[R. W.] Lee says it tasted swell." The "scandal sheet" went on to report gleefully that University policemen apprehended the revelers, took their names, and fined them all. "Mrs. Luebke says Emmeth can't have any of their check to pay his fine," it continued. "He will have to sit it out in jail."³⁶

Like millions of other at-home Americans, the staff and their families contributed to the war effort by doing volunteer work, buying war bonds, and generally going without. A Department Salvage Committee was formed that, in 1942, cleaned out the Physics Laboratory's basement and gathered "some two or three tons of old scrap iron and brass," which was donated to the government.³⁷

The high-energy physics program, spurred in part by wartime research, continued to grow. During the 1943-1944 school year, construction of the 32 MeV proton cyclotron was completed and the machine established in its research program. The Betatron had begun to operate at Illinois in February 1942; in April of 1943, Professor Donald W. Kerst was awarded the Comstock Prize for his invention of the electron accelerator (although the award was not announced until November 1945, for security reasons). In August 1944, while the nation was still in the midst of total war, plans were laid to construct a 250 MeV betatron on the Illinois campus. The planned high-energy machine was designed mostly for "pure" research. "By building a big machine and vigorously supporting the program of research with it," wrote Kerst,

"the University can acquire and maintain a position of leadership and great distinction in physics."³⁸

The cost of setting up the "big Betatron" was estimated at \$1.7 million. It was the intention of the Physics Department to allocate a considerable sum of its own money to high-energy research, as well as to apply for grants from outside sources for assistance. In July 1945, the Illinois General Assembly allocated \$1.5 million to build the 250 MeV betatron, and a structure to house it, at the University of Illinois.

With the conclusion of the war in Europe on May 8, 1945, the United States, and the University of Illinois, began to plan for their peacetime roles. Japan's surrender on August 14, 1945, ended the war in the Pacific, and gradually students and faculty trickled back to Urbana. It was time to readjust to the irenic life, to assess the Department's contributions to American victory, and to reflect on the losses. Once security restrictions were lifted on information regarding the Department's activities, Acting Head P. Gerald Kruger was able to announce the part played by the Department in the war. The Betatron, it was revealed, had been used by the Manhattan Project "to determine certain basic properties of thorium, uranium and plutonium." Professors Gertrude and Maurice Goldhaber "proved the usefulness of beryllium in a uranium pile." Professors Manley and Serber helped write the feasibility reports for the atomic bomb while at MIT's Radiation Laboratory. Professor Serber was part of the government team sent to Japan to study the effects of the detonations at Nagasaki and Hiroshima. In all, twenty members of the Physics Department worked on the atomic bomb project; another thirty-two worked on the radar project. When Professor Loomis returned from MIT in 1946, Professor Kruger resigned his position as Acting Head and turned the reins of command back to the Department Head.³⁹

In many ways, the Second World War had changed the lives of American physicists. The development of the atomic bomb focused attention on the profession in new and sometimes frightening ways. No longer was physics seen as a completely "pure" science, without immediate practical applications. Its exciting possibilities attracted both undergraduate and graduate students in hitherto unseen numbers: for example, while the Department had awarded only four PhDs in 1940, in

1955 it awarded seventeen. The public, too, began to pay attention to developments in all branches of science, but especially in physics, and the physics profession found the eyes of the world trained on it more intensely and more frequently than before. Physicists became aware that they might have a public role to play, that their work could affect the lives of millions of people, and they became more self-conscious, more critical of their own activities.

It was a reflection of this new self-consciousness that when, in February 1950, President Truman ordered the development of a hydrogen bomb, many physicists reacted with alarm. More than one scientist who had worked at Los Alamos expressed regret and confessed that, caught up in the excitement and pressure of groundbreaking research, he had not stopped to consider the implications of so powerful a weapon as the atomic bomb. A group of physicists, including Department Head Wheeler Loomis and Professor Frederick Seitz, who would himself head the Department in a few years, signed an open letter protesting the eagerness with which the hydrogen bomb research was begun and urging caution in its development and use. "We believe that no nation has the right to use such a bomb, no matter how righteous its cause," Loomis and the rest wrote. "This bomb is no longer a weapon of war but a means of extermination of whole populations. Its use would be a betrayal of all standards of morality and of Christian civilization itself."⁴⁰

Other physicists reacted with excitement to their new-found prominence. World War II had united the physics profession and the American government in common cause; the ties formed between the two communities would only be strengthened in subsequent decades. After the war, government became the major supporter of physics research, both pure and applied. At Illinois, World War II started this relationship (the first Office of Naval Research contract was received in 1946); the Korean War cemented it. But the years between the two conflicts were fruitful ones for the Physics Department.

The post-war era in American science was the dawn of the computer age. On January 8, 1948, the Board of Trustees of the University of Illinois approved the purchase of a large digital computer, for the sum of \$150,000. It quickly became apparent, however, that the company commissioned to build the machine--the Reeves Instrument Company of New

York--would be unable to do so. The University's Research Board, then headed by physicist Louis Ridenour, proposed that it design a computer itself, based on a model recently completed at Princeton University. On January 13, 1949, the Trustees authorized the Research Board to proceed.⁴¹

The next month, the Digital Computer Laboratory (DCL) was organized and charged with the task of designing and building the University's first computer system. Ralph Meagher of the Physics Department was named Chief Engineer. The project was advanced by an agreement with the United States Army, which offered to pay one-half the cost of research and development if DCL would build two computers and install one at the Aberdeen Proving Grounds. The Army computer was given priority, and by the winter of 1951, ORDVAC was completed. One year later, it was installed and running at Aberdeen. Later that year, in September 1952, the second machine was built. The Illinois Automatic Computer, or ILLIAC, as it was called, was installed in the University's old power plant and was first used on September 22, 1952. Immediately the ILLIAC became one of the busiest machines on campus. At the time, it was state of the art: "it performed with an add time of 92 microseconds and a multiplication time of 700 microseconds." The 40-bit parallel computer measured ten feet long and two feet wide, weighed five tons, and contained 2800 vacuum tubes. "The Physics department does calculations for scores of important experiments" on the machine, said the *Illinois Alumni News*, "many of them vital to the national welfare." But then, as now, computer technology was advancing so rapidly that the spiffy new ILLIAC would be outdated within a few years.⁴²

In 1949, Wheeler Loomis further enhanced the quality of the University of Illinois Department of Physics by inaugurating a full program in solid state physics, one of the first in the nation. The program was interdisciplinary, run by a committee of representatives from physics, chemistry, and several engineering departments. It was to be led by Professor Frederick Seitz, who came to Illinois from the Carnegie Institute of Technology, where he was Head of the Physics Department. "Professor Seitz has been one of the country's outstanding leaders in the development of the theory of solids to its present state," wrote Loomis. In addition to Professor Seitz, the Department

hired Robert Maurer, David Lazarus, and Charles Slichter in 1949. James Koehler and John Bardeen came in 1950 and 1951, respectively. Loomis was excited about both the theoretical and applied prospects of solid state physics; he wrote, "The establishment, at Illinois, of a strong group working in the fundamentals of this subject...promises to be a most effective means of promoting these applications."⁴³

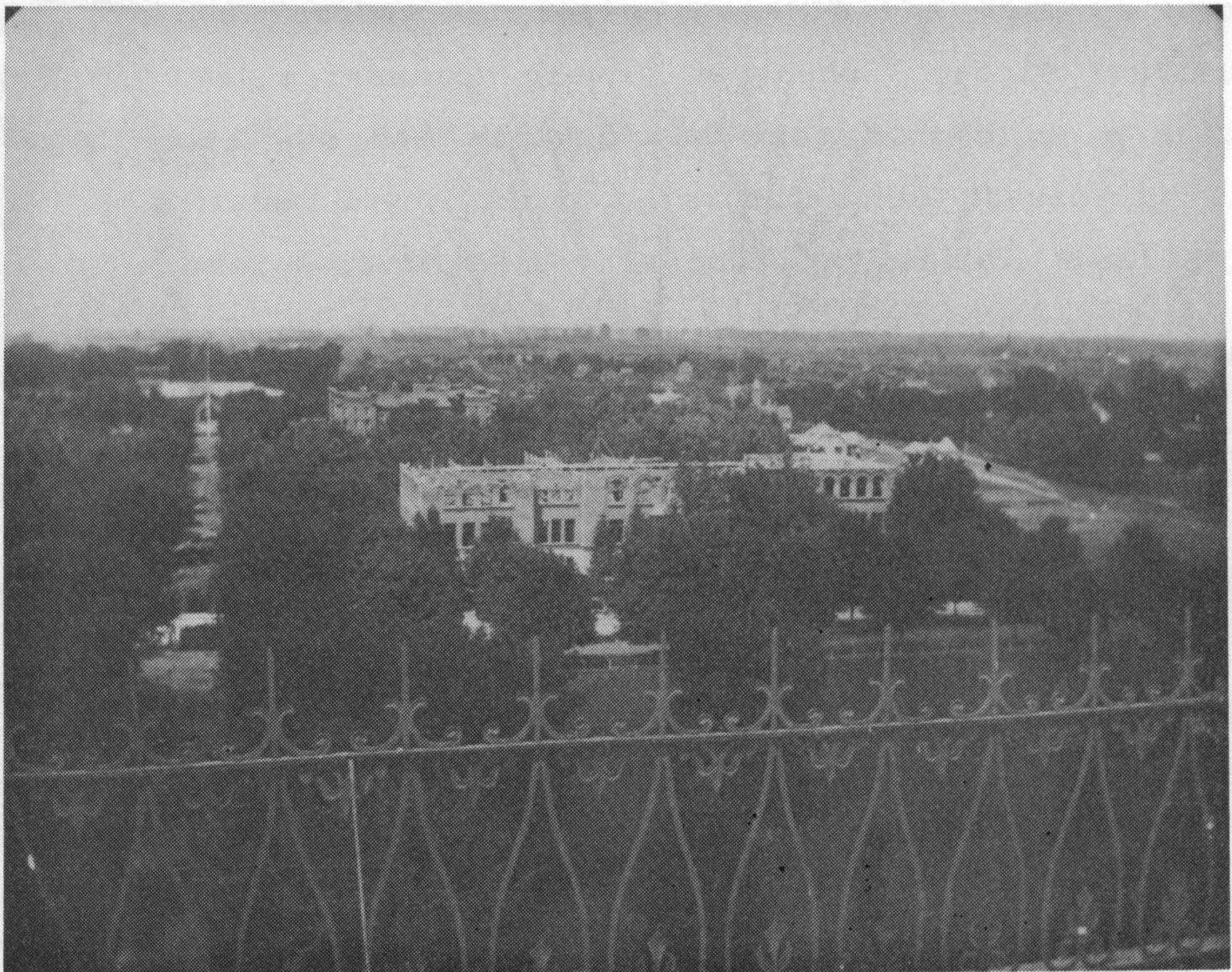
In 1950, a further innovation came in the form of a new low-temperature physics research group. A young Carnegie Institute PhD, Dillon Mapother, who had arrived the year before as a solid-state physicist, initiated low-temperature experimental physics at Illinois. Other early researchers in that area included John C. Wheatley, Donald M. Ginsberg, C. B. Satterthwaite, and the current department Head, Ansel C. Anderson. By 1965, Wheatley would achieve the "lowest sustained temperature in the world"--three thousandths of a degree above absolute zero. Professor Wheatley, who moved to the University of California at San Diego in 1967, "is regarded as one of the world's top half-dozen experimental physicists working with liquid helium at ultra-low temperatures," said *Engineering Outlook*, "and he is a pioneer in developing experimental techniques to work in this previously inaccessible area of physical phenomena."⁴⁴

1950 was a banner year for the Illinois Physics Department and for the country. The 300 MeV Betatron, built with funds from the State of Illinois and more powerful than the designers had at first intended, began to operate on February 15. By April 18, the Betatron was put on "scheduled operation," meaning that researchers could submit requests for time on the machine so that more than one project could be handled simultaneously. The "big Betatron" weighed 400 tons; the diameter of the vacuum tube was nine feet. About seven projects were begun on the accelerator that April.

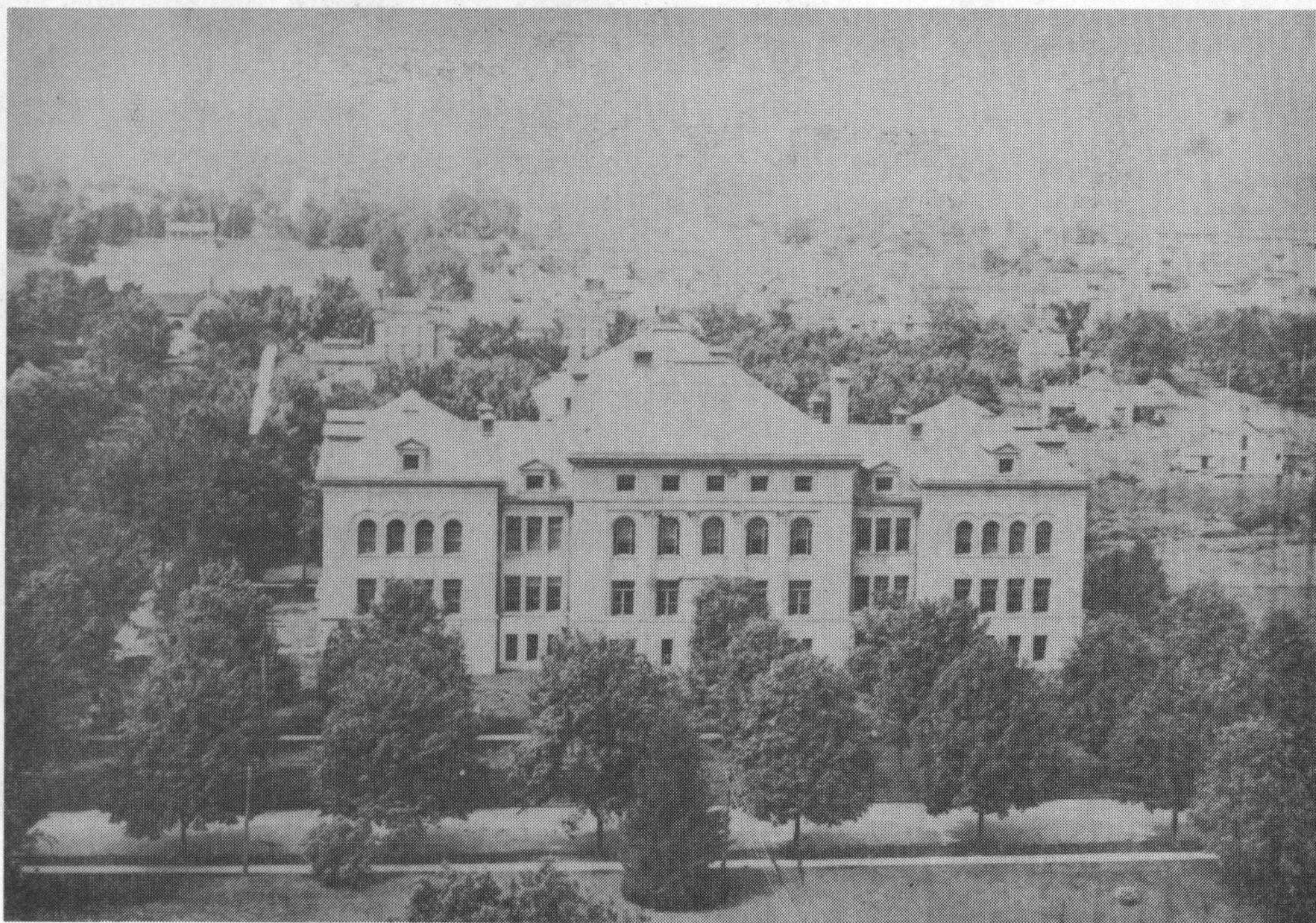
Then, on June 27, 1950, less than five years after the conclusion of World War II, the United States found itself embroiled in another conflict when it sent troops to the aid of the embattled South Koreans. Again the Radiation Laboratory at MIT was called to defense research. Soon Wheeler Loomis would be receiving pleas to help lead Project Charles, and later he would become director of the Lincoln Laboratory; both projects were focused on developing defenses against an air attack.



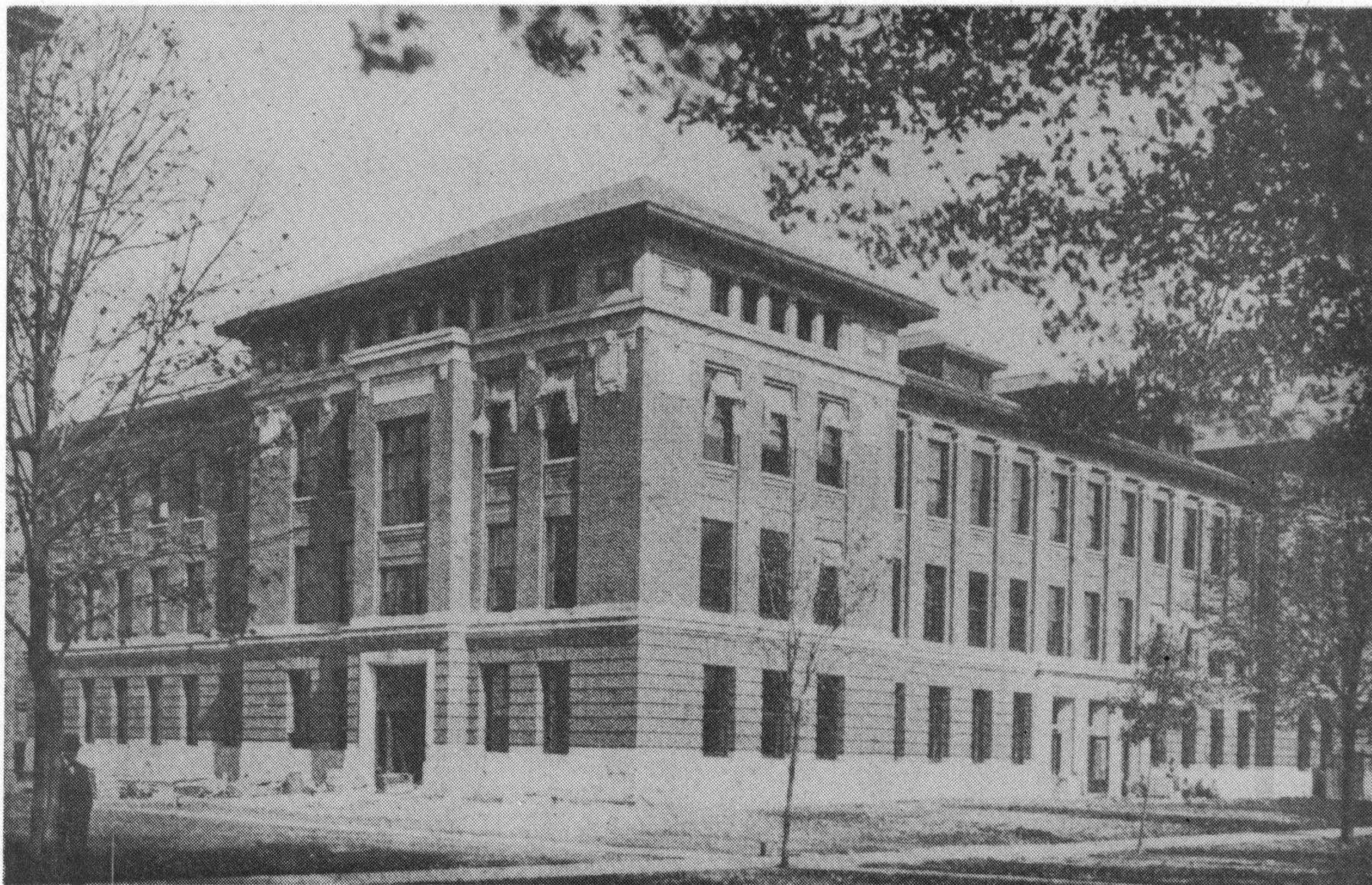
University Hall, first home of the Physics Department, 1893



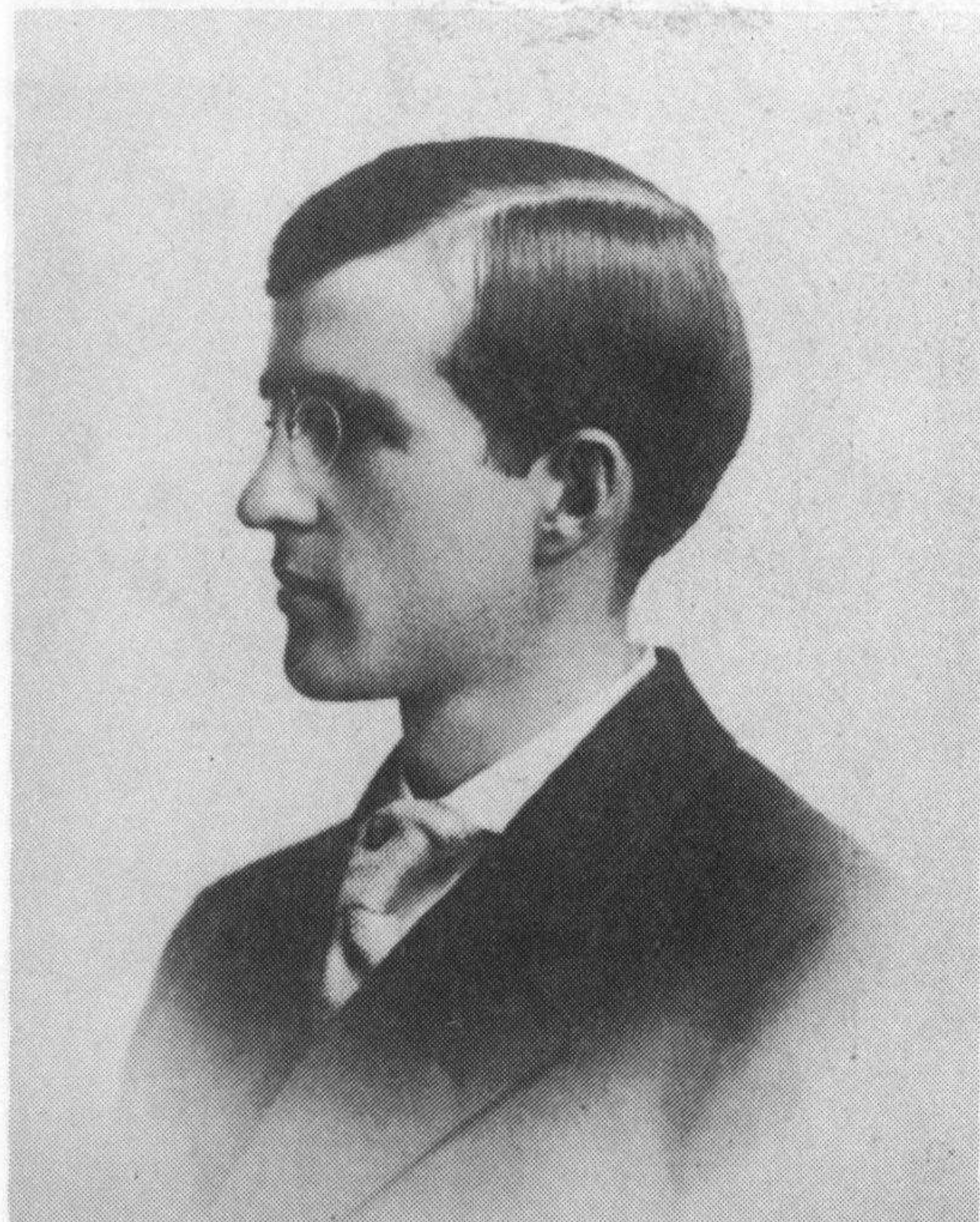
Engineering Hall under construction, 1894



Engineering Hall completed in 1895. The second location of the Physics Department from 1894 - 1909.



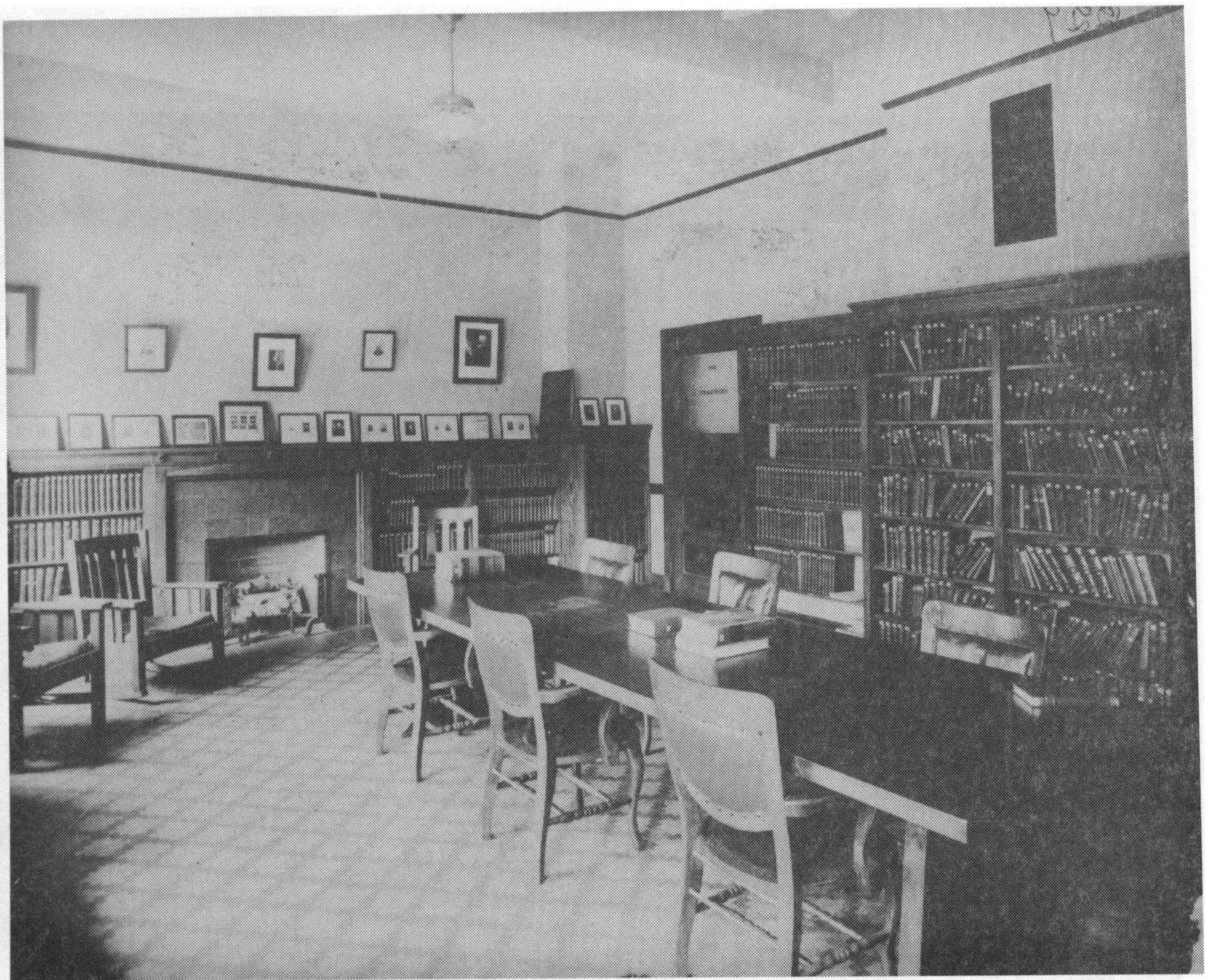
The Laboratory of Physics, shortly before its dedication, 1909.



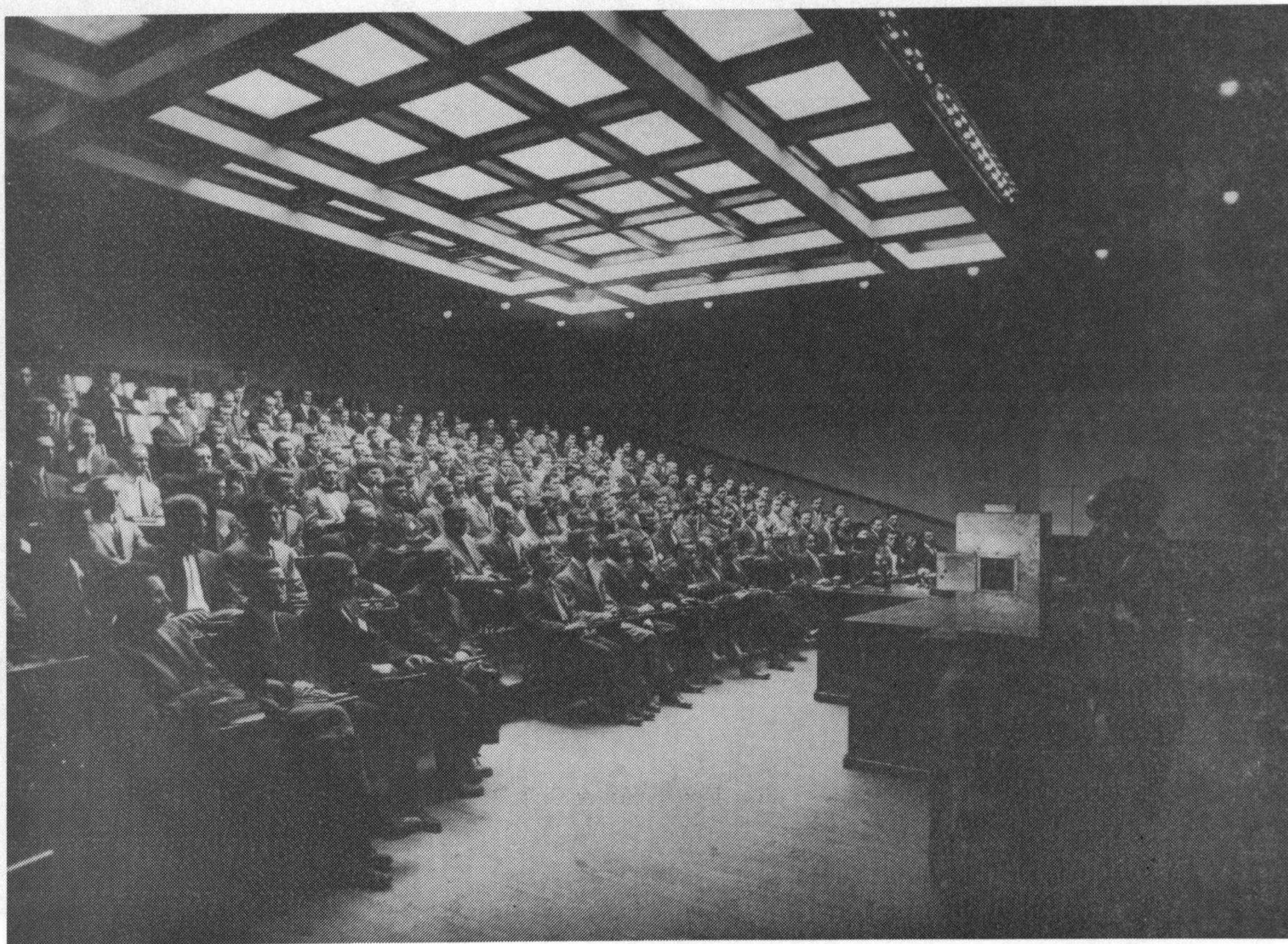
First Physics Ph.D. recipients -- Elmer Williams and Edward B. Stephenson, 1910.



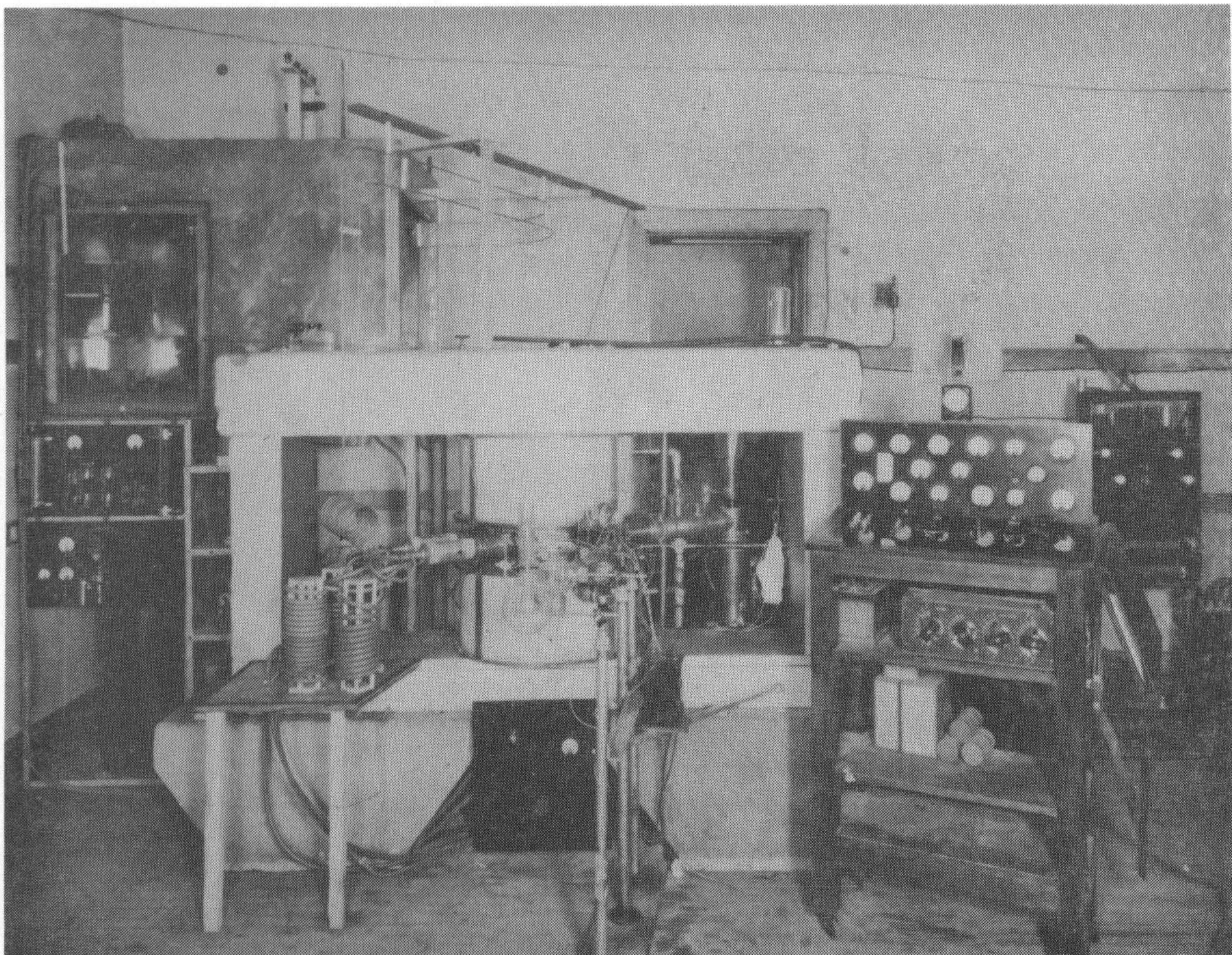
The Physics Department faculty in 1911, with 6 professors and 7 assistants. The head of the Department, A. P. Carman, is on the far right.



The Physics Seminary and Library, 1912 - 1914.



A Physics lecture given in room 101 of the old Laboratory of Physics (now the Metallurgy and Mining Building), c.1920.



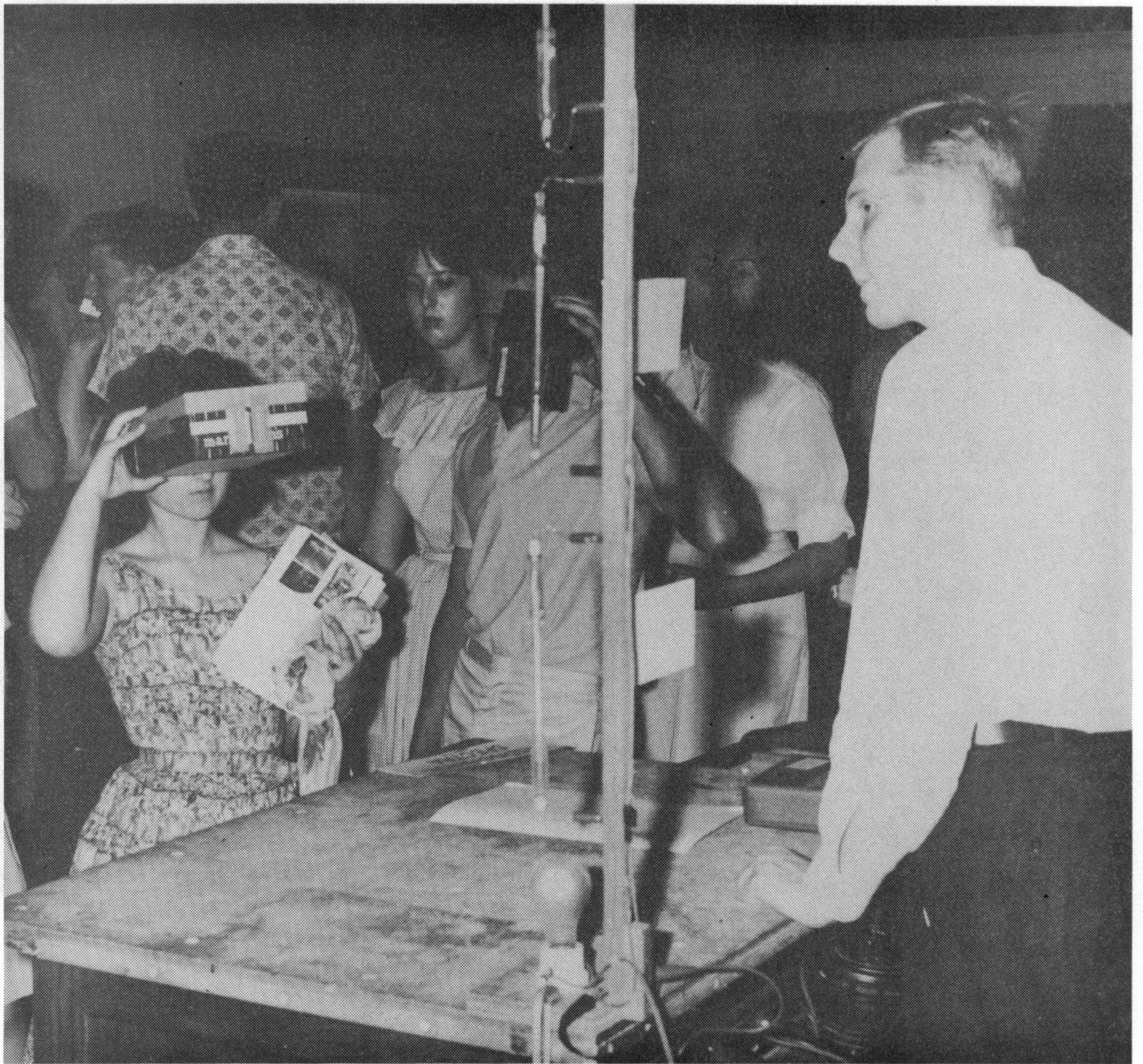
The first cyclotron built at the University of Illinois in 1936 by Professor P. Gerald Kruger.



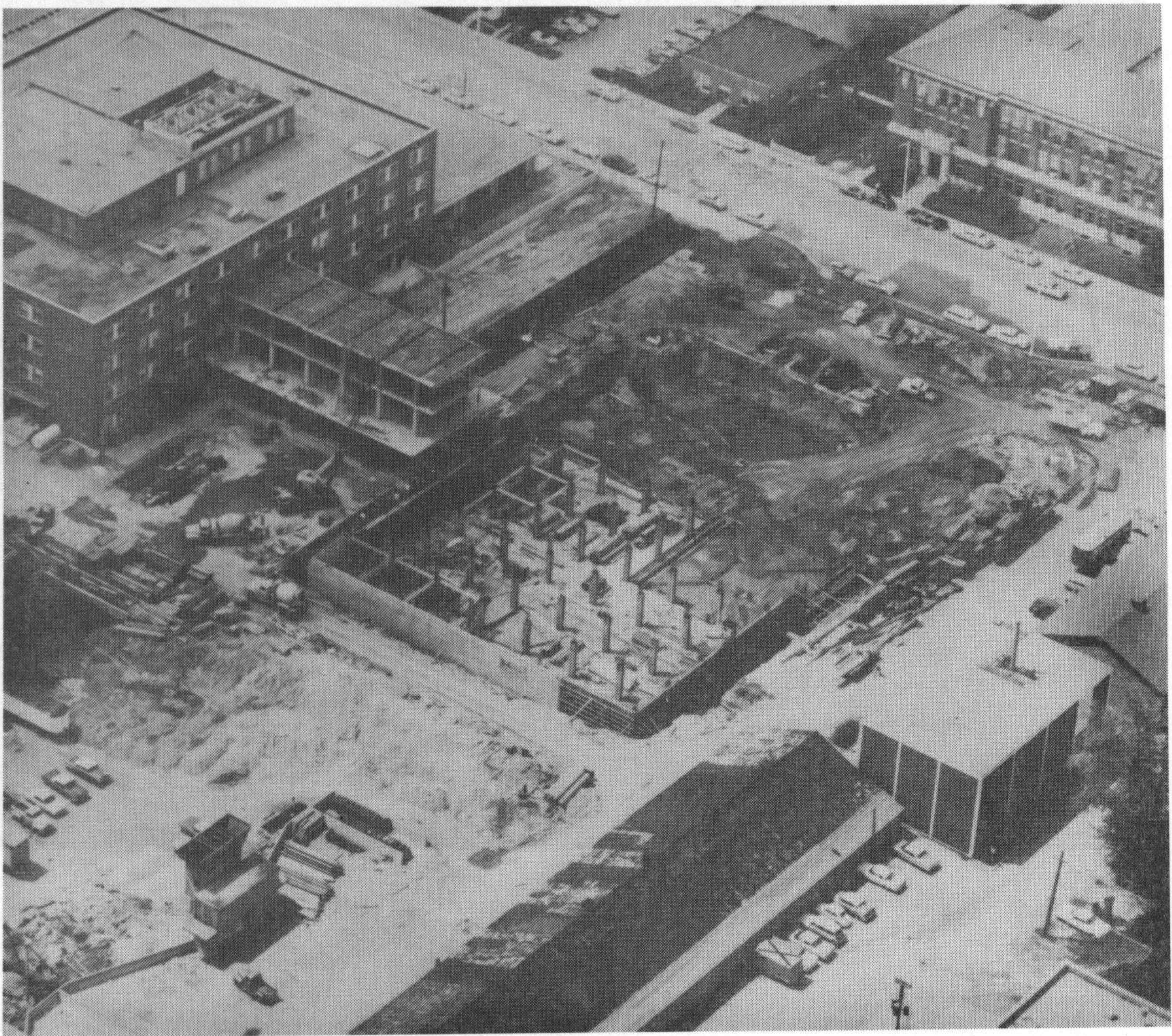
"Very Secret Work in France" was taken in January, 1945, in a house on the outskirts of Etain, France, the location of a US 19th Tactical Air Command P-47 air base. C. A. Fowler (B.S. '42), left, helped set up a radar landing system at the base. Fowler was then involved in the development of the system at the MIT Radiation Lab. He later became senior vice president of Mitre Corporation, and is now a private consultant. Many faculty and students left the Department during that war to serve at Rad Lab and other defense laboratories, leaving only a small crew of instructors at Urbana to teach a large and transient group of military personnel.



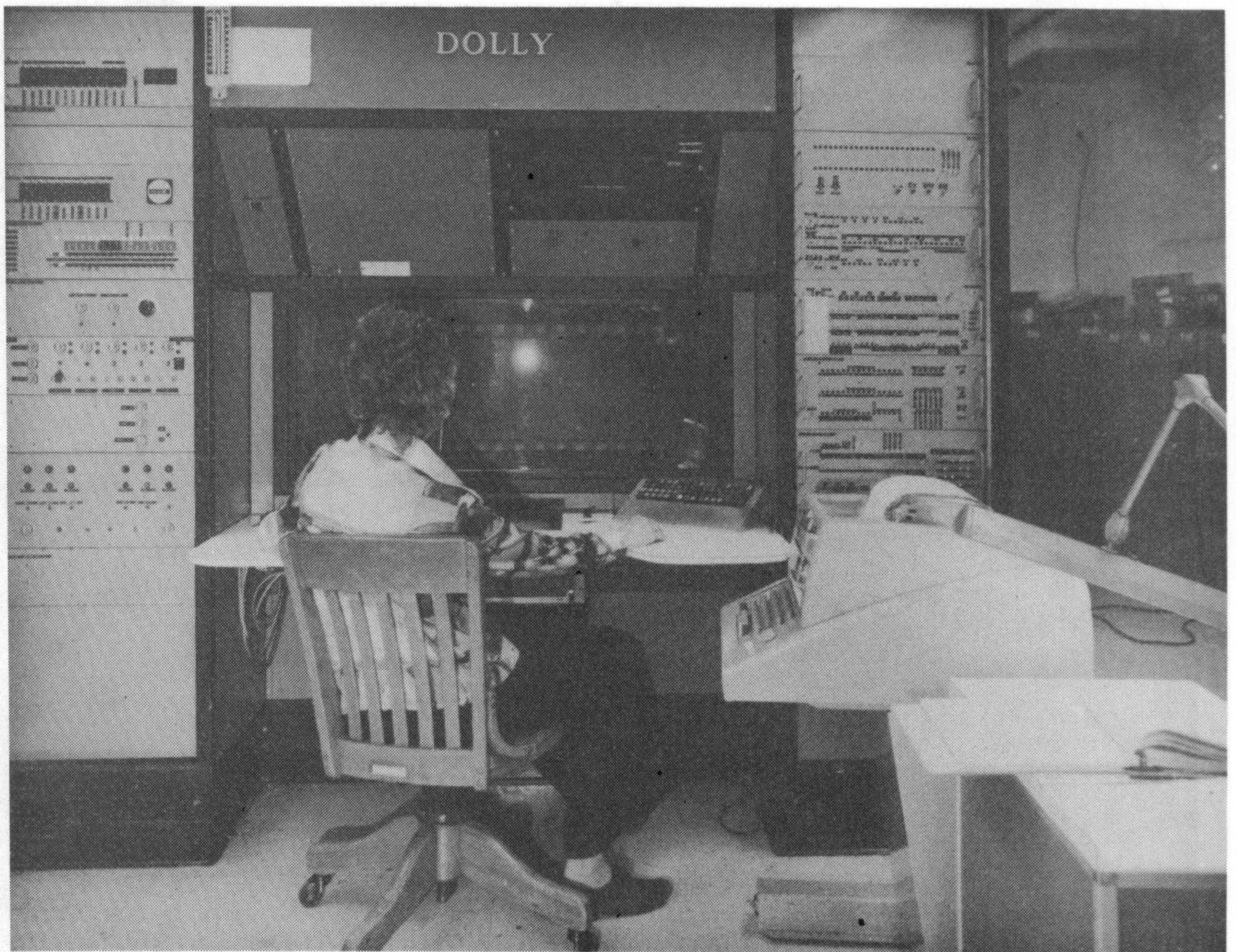
After World War II, University housing was, for many returning veterans, simply a cot and a locker in Kenney Gym, formerly known as Men's Old Gym.



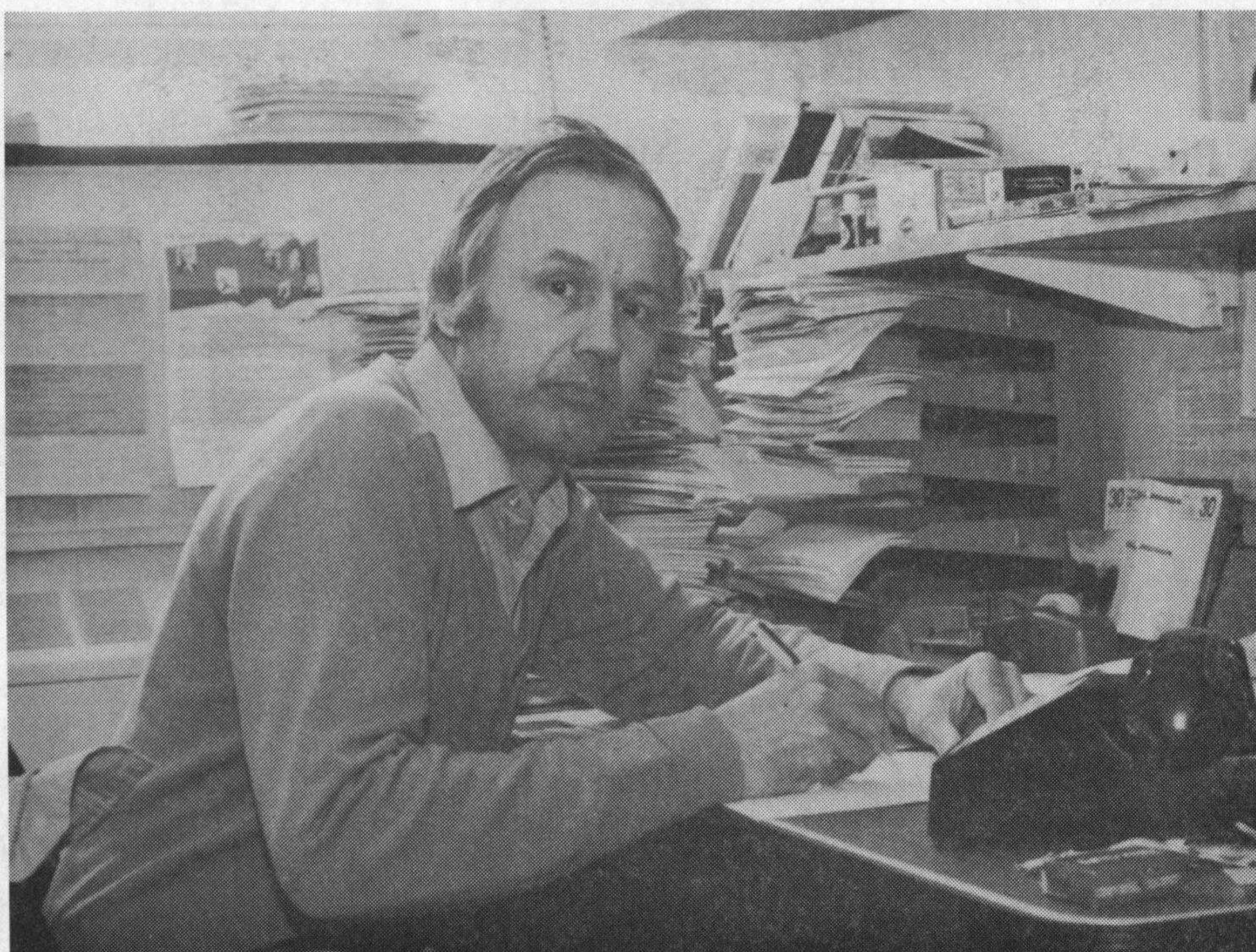
An Engineering Open House demonstration of optical spectra, 1961.



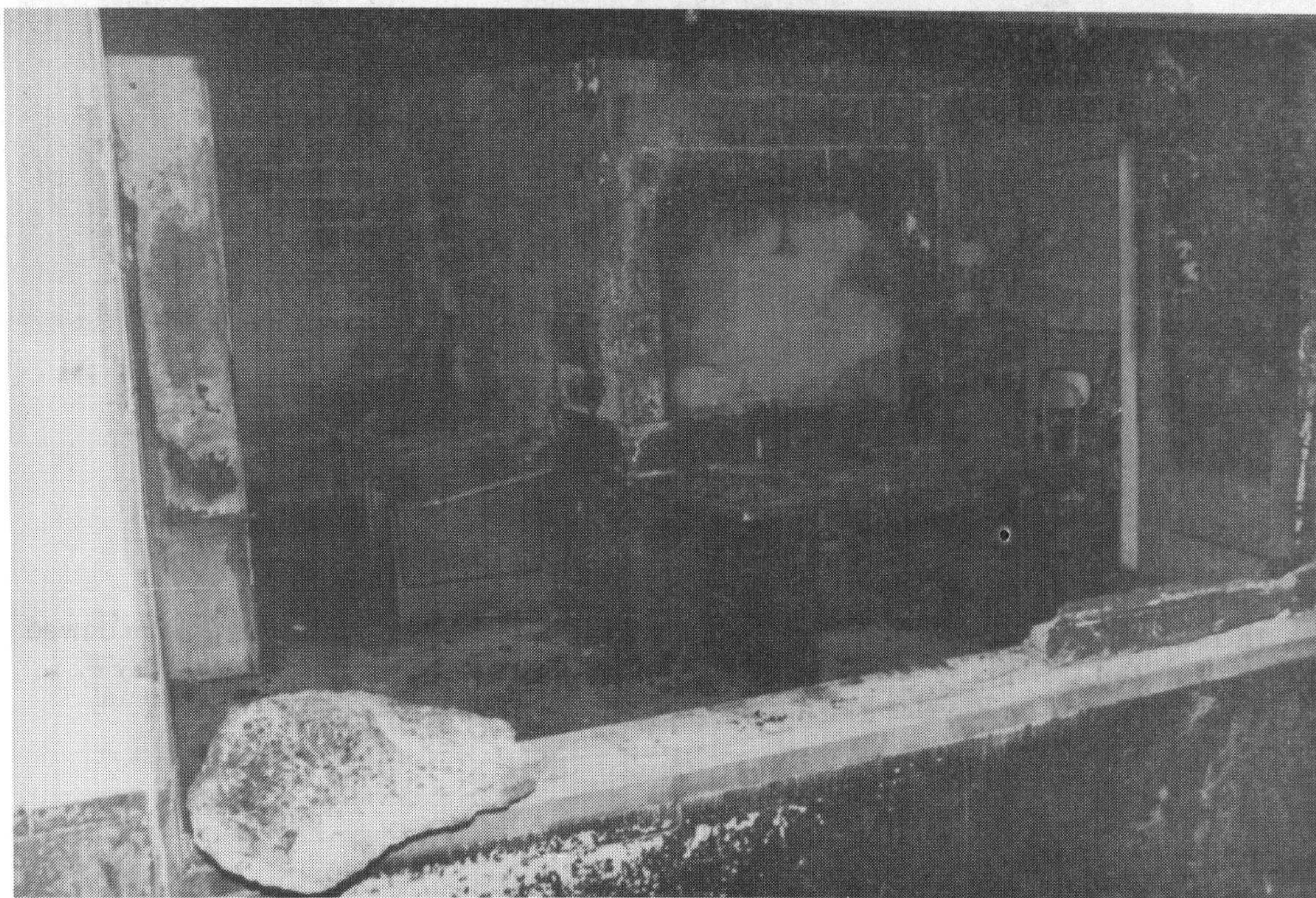
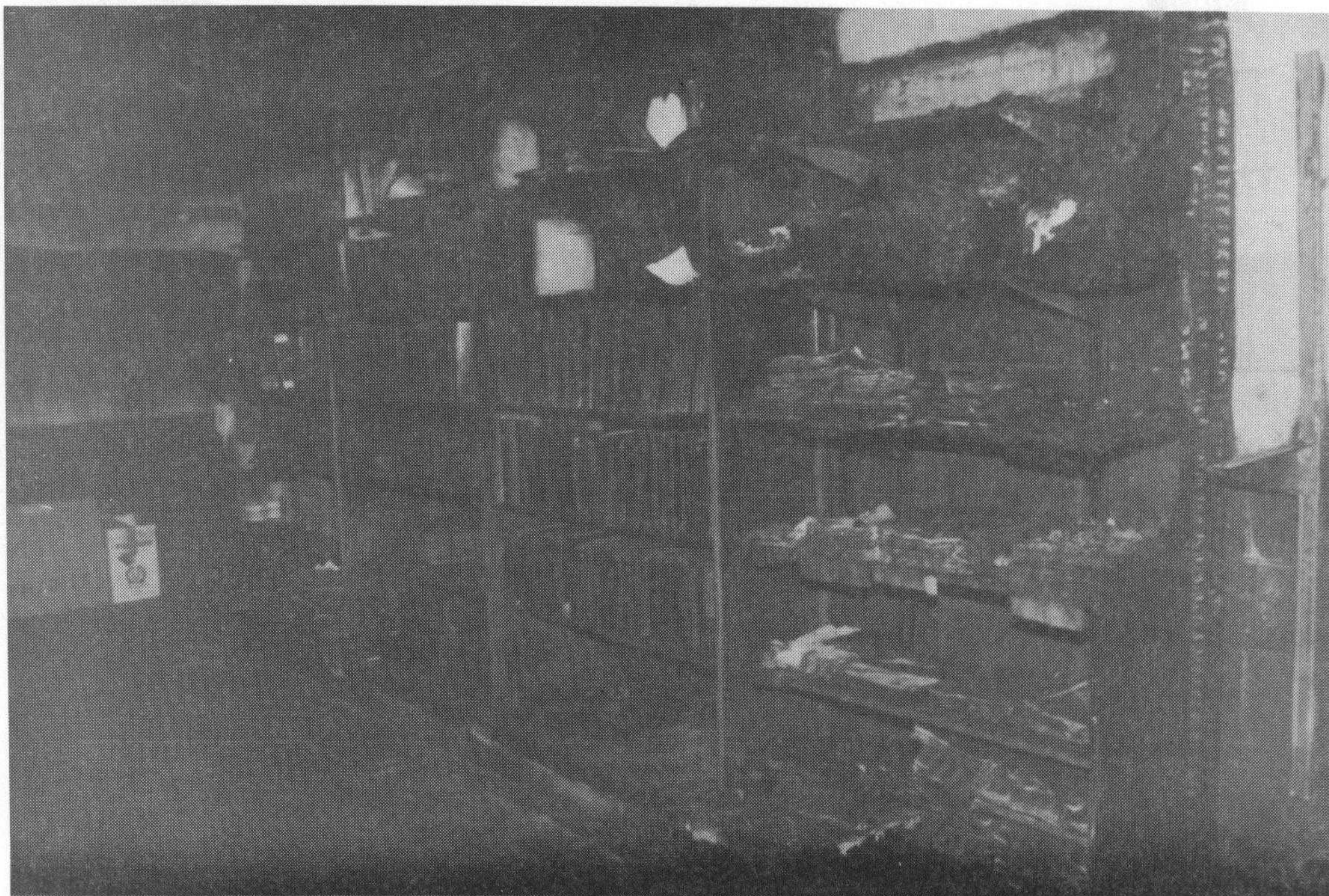
The Materials Research Laboratory under construction in 1964.



The CSX-1/Dolly system greatly speeded the task of measuring data on over one million pictures taken at the Argonne, Berkeley, and Brookhaven national laboratories during the 1970's.



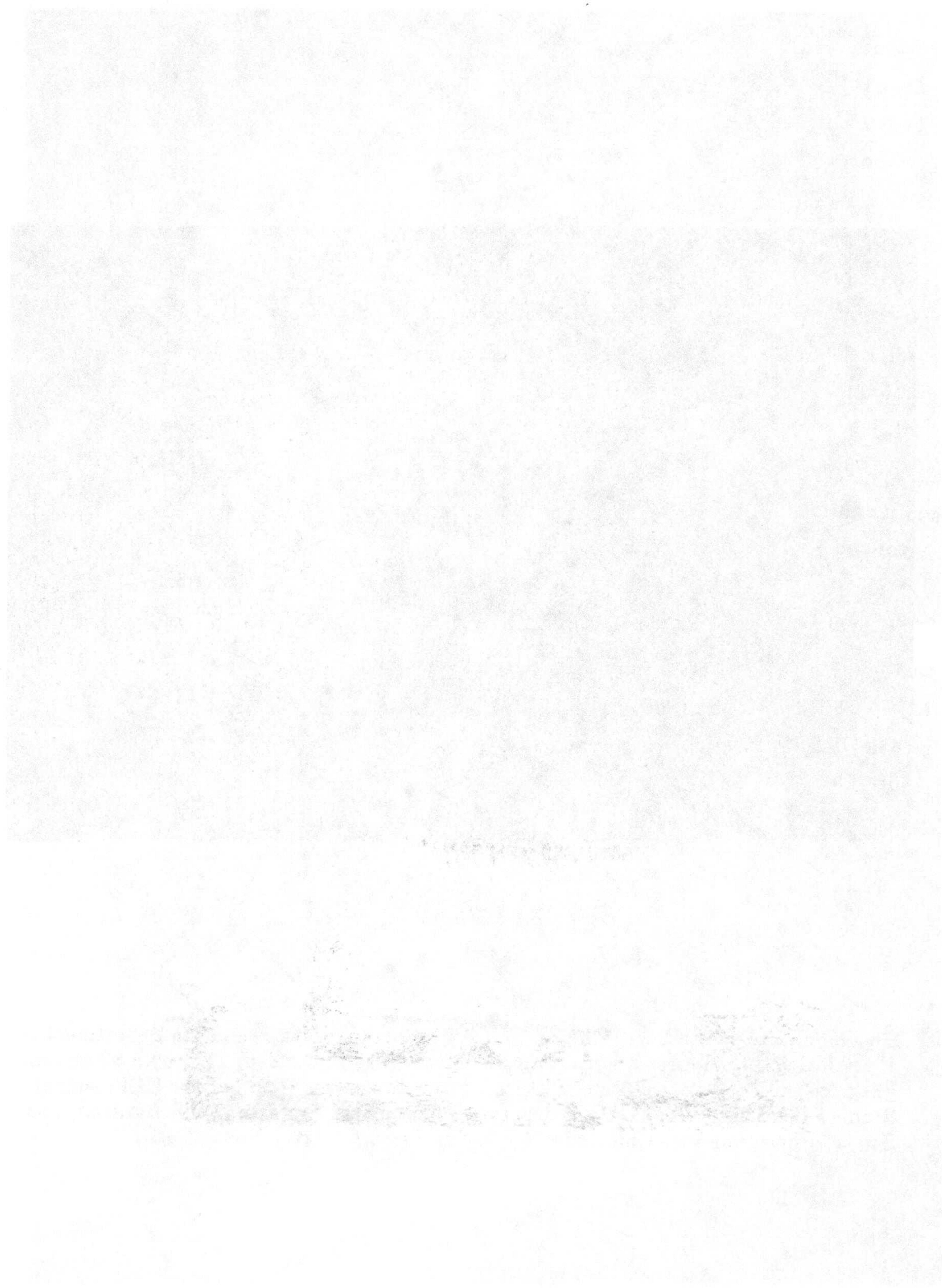
In 1982, the John D. and Catherine T. MacArthur Foundation established an endowed chair at the University of Illinois with a \$1.2 million grant. Professor Anthony J. Leggett joined the Physics Faculty as the first John D. MacArthur Professor.



On February 25, 1984, fire nearly destroyed the Loomis Laboratory of Physics. Damage to the building totalled nearly a half million dollars.



The John Bardeen Endowed Chair in the Department of Physics and the Department of Electrical and Computer Engineering was established in October, 1989 by a \$3 million gift from the Sony Corporation. Pictured in the foreground from left are UI President Stanley Ikenberry, Illinois Governor James Thompson, Professor John Bardeen, and Sony Corporation Vice-Chairman Michael Schulhof.



Loomis and other Illinois administrators worried that the Korean War would cause the University's resources to be depleted, as World War II had. It was ironic, then, that Loomis was the first to go. His services seemed as essential to Project Lincoln as they did to the University of Illinois; "Of course, the trouble is," sighed George Stoddard, President of the University, "there are not enough Wheeler Loomises to go around." In his absence, Gerald M. Almy became the Department's Acting Head.⁴⁵

Hoping to avoid the mass exodus of Urbana researchers and graduate students that had occurred in the last war, Dean of the Graduate School Louis Ridenour proposed that a defense research project be undertaken at Illinois. "We ought to make a conscious effort," Ridenour wrote to Loomis, "to see whether there was not some area in which we could plan to take a big contract..., in an effort to keep the boys down on the farm this time, rather than dispersing them." His plan was to attack the problem of a reliable, computerized missile guidance system, a difficulty that had long plagued the Air Force but that would be unlikely to receive proper attention in a wartime government research laboratory. Such a project would keep some of Illinois' best physicists at home while simultaneously drawing attention to the contributions of the University. Ridenour made his proposal first to Wheeler Loomis and then, eventually, to the Board of Trustees; by 1951 the Control Systems Laboratory (CSL) had been established and set up in temporary quarters on the fourth floor of the Physics Laboratory. Frederick Seitz was given the position of Director; he was joined by Doctors Nordsieck, Sherwin, Kruger, Meagher, Lyman, Hulsizer, Quastler, and Lavatelli, all of the Physics Department. By the fall of 1951, CSL had moved to a more spacious setting in the Engineering Research Laboratory. Seitz served as Director of CSL only until 1952, when Wheeler Loomis returned from MIT and Seitz was freed to go back full-time to Physics.⁴⁶

The Control Systems Laboratory was funded by grants from the three branches of the Armed Services, with most of the money coming from the Air Force. The Laboratory was to focus attention on radar and on possible uses of the new digital computers, a field in which ILLIAC had made the University of Illinois prominent. Though Dr. Ridenour had originally anticipated that CSL would work on missile guidance systems,

this research program never materialized. Instead, according to a 1964 report, the scientists focused on "new areas of information theory and automatic computers that, combined with radar developments emerging in 1946 and not exploited since, could be expected to prove revolutionary in impact on the military problems of command and control, including battlefield surveillance." Some of the "completely novel ideas" that emerged from CSL included Coherent Doppler Radar (capable of obtaining very high resolution mapping) and the All Weather Attack System (for tracking moving surface vehicles). The Laboratory also conducted studies in cybernetics, antisubmarine warfare, and the detection of radar signals in noise.⁴⁷

The year 1953 marked the opening of Argonne National Laboratory, located twenty-eight miles southwest of Chicago, some seven years after its formation by the Atomic Energy Commission. The Board of Governors of Argonne included F. Wheeler Loomis and Andrew C. Ivy of the University of Illinois; Ivy, P. Gerald Kruger, and William L. Everitt served consecutively as representatives to the Executive Board of the Council of Participating Institutions. Argonne, though in many ways an important resource for Illinois physicists--it had programs in fast reactor physics, fast reactor safety, fuels and materials development, components technology development, nuclear and atomic physics, and fission theory, and it eventually boasted a superconducting linear accelerator for heavy ions--also was to present a sort of obstacle in the years ahead. High-energy physicists in the Midwest had long hoped for the construction of a large accelerator in their region, as an alternative to the existing facilities at Brookhaven and Berkeley. At the time, Argonne had only a 60-inch radius cyclotron that could produce particles of 30 MeV. What midwest high-energy physicists wanted was, obviously, high energy, preferably in the three to six GeV range.⁴⁸

In 1953 the U. S. government announced its intention to build a national accelerator, and began the search for an appropriate location. That spring, the Midwest Universities Research Association (MURA) was formed and Donald W. Kerst of Illinois was appointed its technical director. MURA's purpose was to advocate a midwest location for the new accelerator and to assist in site approval and accelerator design. To the government, Argonne seemed a natural location for a midwest

accelerator; to university physicists, such a site implied threats to free research and undue interference in their work. They preferred an accelerator financed by the government, but located at a university and controlled by academic researchers, such as themselves. MURA's purpose, forever thwarted, was to argue for such a machine, preferably located near Madison, Wisconsin. Not until the Fermi National Accelerator (or Fermilab) was constructed in Batavia, Illinois, from 1968 to 1974 did MURA see its wishes fulfilled, though the organization itself slowly faded away.⁴⁹

The Korean War ended on July 27, 1953, and the nation entered an era of prosperity coupled with political turmoil, both of which affected the University of Illinois. In 1954, nationwide, the physics community rallied behind a Manhattan Project physicist, J. Robert Oppenheimer, to support his defense against charges of a security breach by the U.S. Atomic Energy Commission. Several groups published open letters in his support, emphasizing his value as a brilliant physicist. One such letter was signed by thirty-eight faculty members of the Department of Physics at the University of Illinois. The Illinois physicists began with a brief statement to the Council of the American Physical Society and to the Board of Governors of the American Institute of Physics. Dated April 15, 1954, it read only, "We hope and expect that you will issue strong statements in support of Oppenheimer." A second, more elaborate letter appeared in a number of newspapers, including the *Champaign Courier* (April 18) and the *St. Louis Post-Dispatch* (April 20). The Illinois physicists wrote that they "wish to reassure the public that there can be no reasonable doubt" of Oppenheimer's loyalty, and warned that scientists of "ability and integrity" would hesitate to accept advisory positions in the government if they might be punished for voicing unpopular views. The letter was signed by twenty-eight faculty members, including Department Head F. W. Loomis and Associate Head G. M. Almy. Ultimately, the AEC found the charges not valid; however, they still withdrew Oppenheimer's security clearance.⁵⁰

Yet these were good times for physics, too. The new prosperity meant the expansion of funds available to public universities such as Illinois. Since the mid-1930s, the Physics Department had been pressuring the University to provide funds for the expansion and

renovation of its facilities. By all accounts, conditions were desperately overcrowded in the old Physics Laboratory. On October 29, 1938, Dean M. L. Enger of the College of Engineering wrote to President Willard that "an addition to the Physics Laboratory has probably become the greatest building need of the College of Engineering." During World War II, several courses were discontinued and their classrooms converted to laboratories for defense research. Space that had been intended only for storage--such as the basement, fourth floor, and even some stairwells--had gradually been converted into offices, laboratories, classrooms, and library facilities. Additional space around the campus had been requisitioned and converted for physics use, so that an old garage was transformed into the Nuclear Radiation Laboratory for the cyclotron, the Control Systems Laboratory set up shop in the Engineering Research Lab, and the Betatron Laboratory was located in the old power plant.⁵¹

In 1956, after years of wrangling with the Board of Trustees, the University Building Committee, and even the State of Illinois General Assembly, plans were finally approved for an entirely new physics building. Two million dollars was granted in the 1957-1959 biennium to construct the major part of the Physics Building, located on the northeast corner of Green and Goodwin Streets. It was completed in 1959. The second part of the building, where the large lecture rooms and the lobby are located, was finished in 1963. In addition, the last decade has seen the development of extensive rotating displays in the lobby which are uniquely designed to highlight new faculty members, areas of specialized Physics research, support staff services, departmental awards, and items of historical interest. It was called simply the "New Physics Building," and its rooms were, according to the *Technograph*, designed with the student in mind: "For his comfort the seats are plushly upholstered and for his ease of vision they are on a steep incline. For his enlightenment the rooms are equipped with closed circuit television and modern lecture demonstration facilities." The old Physics Laboratory was then occupied by the Department of Mining, Metallurgy, and Petroleum Engineering; in 1963 that building's name was changed to the Metallurgy and Mining Building.⁵² High above the east

entrance, the word "Physics" remains etched in granite until this very day.

In 1955, Wheeler Loomis received an indirect honor of the most glorious sort, the sort a dedicated teacher dreams about, when his student Polykarp Kusch was awarded the Nobel Prize in Physics. Kusch wrote his doctoral dissertation at University of Illinois under Loomis; completed in 1936, it was titled, "The Molecular Spectra of Caesium and Rubidium." Kusch and his co-winner Willis Lamb won the 1955 prize for the "precision determination of the magnetic moment of the electron." Kusch, whom Loomis described as "much the brightest graduate student I've ever had," received an Honorary Doctor of Science degree from Illinois in 1961.⁵³

The Department found itself enjoying in 1956 the most publicity it had received since the invention of the Betatron. The recruitment of John Bardeen in 1951 had been a real feather in Loomis's cap. Bardeen came to Illinois from Bell Laboratories, where he, Walter Brattain, and William Shockley had done the research on transistors that led to their winning the 1956 Nobel Prize in Physics. Loomis himself had nominated Bardeen and Shockley for the prize; he had written to the Nobel Committee for Physics:

It is noteworthy that the invention was achieved by a process which was, for an invention, extraordinarily and perhaps uniquely scientific....[M]any hundreds of scientists who had been working intensively with germanium crystal rectifiers throughout the war missed this invention, presumably through inadequate application of recent solid state theory.⁵⁴

"There was general rejoicing in the department" when the news was received of the prize, according to the 1956-1957 *Annual Report*. The significance of the invention that had earned the prize was nicely summarized by the *Bell Laboratories Record*, which stated, "As new transistors and related semiconductor devices are developed and improved, the possible fields of application for these devices increase to such an extent that they may truly be said to have 'revolutionized

the electronics art.'" Indeed, the invention had revolutionized virtually the entire technological world. "Whose life on earth hasn't been changed by the transistor?" asked an Illinois professor of electrical engineering. High-speed computers, pocket calculators, and countless other conveniences were made possible by the little device. Yet when Bardeen received word of this, his first prize, he had only recently "completed a very successful solution to an old and difficult problem--a theoretical explanation of superconductivity in certain metals," for which he would earn a second Nobel Prize in 1972.⁵⁵

The Digital Computer Laboratory, which had begun offering classes to students in 1954, became a full department in May 1957, with physicist Ralph Meagher as its first Head. Two subsequent Heads, John R. Pasta and James N. Snyder, were also professors of physics. The Digital Computer Laboratory changed its name to the Department of Computer Science in November 1964 (though its building is still known as DCL). By this time, the Department of Physics established a new requirement that all engineering physics majors take a computer programming class.

In 1957, Wheeler Loomis retired as head of the Physics Department (though he remained until 1959 as Director of CSL) and was replaced by Frederick Seitz, another man of remarkable organizational and leadership skills. Almost immediately a movement began to honor F. W. Loomis by naming the "new" Physics Building after him, but it was the University's policy to confer such an honor only rarely, and never while the person still lived. Upon Loomis's death in 1976, a request was made again to honor the man who, "through his own example of integrity, honesty, and directness" had "created a department that even to this day is almost unique in its freedom from factionalism or internal power struggles," a department that ranked among the top physics departments in the country. In 1977 the building was renamed, and a dedication ceremony was held on February 14, 1980. A plaque mounted in the entryway of the Loomis Laboratory of Physics commemorates Francis Wheeler Loomis's contributions to the University of Illinois and to the science of physics.⁵⁶

Loomis's death inspired many of his former colleagues to contemplate these contributions. Through his determination, charm, and

talent for playing "the 'old-boy' network like a virtuoso," Loomis built the department twice--once at the beginning of the Depression and again after World War II. He was "stern in bearing; his general aspect and his way of looking at you definitely commanded respect." Yet his firm hand was a benevolent one, and his principal concern was the professional and personal well-being of his Department. Another biographer remembered his keen perception of scientific talent and "his ability to generate a strong enthusiasm and sense of purpose among his colleagues." Certainly, Francis Wheeler Loomis had a highly refined sense of the value and significance of his chosen profession. In "Can Physics Serve Two Masters?" a 1950 article that has become something of a classic, Loomis wrote:

To a physicist the one master can only be real physics; the search for understanding of the world. Whoever has a part in this, however small; whoever uses the methods of physics...for the purpose of increasing understanding, in whatever field, whether in nuclear physics or in biophysics or in, say, the peculiar properties of rubber, is a physicist; a title made glorious by much of the deepest and subtlest and clearest understanding that man has ever achieved.⁵⁷

III. "Every Department must look to the future..."

As the 1950s drew to a close, University programs in or related to physics expanded more rapidly than ever. In 1958, Dr. Felix T. Adler, who was instrumental in making the University into a center for reactor science and engineering, received a joint appointment as Professor of Physics and Nuclear Engineering. In September of that year, the University initiated a program for the master's degree in nuclear engineering; the first was awarded in June 1959. In April 1959, the Nuclear Reactor Laboratory was established, and the next year, the TRIGA Mark II reactor was completed and made available for teaching and research. A PhD in nuclear engineering was possible by January 1961, although an undergraduate degree program was not established until March 1974, and the Department of Nuclear Engineering was not established until March 1976. In 1969, the Atmospheric Research Laboratory was formed, with physicist Yoshi Ogura as its Head; the Department of Atmospheric Sciences would replace the Laboratory in 1981.

The Department of Physics has enjoyed an especially close relationship with the Astronomy Department. Until 1952, instruction in astronomy at Illinois was available only on the undergraduate level and was managed by only two staff members. The program was accelerated in 1958 when graduate study was initiated. The 1972 arrival of Dr. Icko Iben, Jr. (who had earned his PhD in physics at Illinois in 1958 under J. D. Jackson) as Head of the department meant the development of a strong program in theoretical astrophysics. This program has led to joint appointments in Physics and Astronomy and complements nicely the work of a number of Illinois physicists, who work on the physics of neutron stars, white dwarves, compact x-ray sources and supernova ejecta. The union between Physics and Astronomy was further cemented in

1979 when the libraries of the two departments were merged; this library's collection now boasts over 46,000 volumes and 290 journals.⁵⁸

At the end of the decade of the 1950s, with the Korean War only a memory, the research orientation of the Control Systems Laboratory (CSL) moved away from secret defense work. The laboratory staff decided that CSL ought to move toward "a broad program of pure and applied science with classified research continuing in a reduced role." In the fall of 1959, Professor of Physics Daniel Alpert was named Head of CSL and its name was changed to the Coordinated Science Laboratory, to reflect its new emphasis on interdisciplinary, peacetime scientific research, though the acronymic title was retained. The next year, CSL began the development of PLATO, a computer-based education system. Future research activities would include projects in plasma and surface physics, atmospheric physics, and semiconductors.⁵⁹

Under the leadership of Frederick Seitz, the Physics Department entered the 1960s, a decade of tremendous political and social upheaval. The civil rights and women's movements, the sexual revolution, student riots, and war protests all made themselves felt on the University of Illinois campus, and the Department of Physics was not immune to their influence. A catchword of higher education in the 1960s, "relevance," began to affect even physics. This new trend in education emphasized applicability to the "real world," and scientists, as well as many other professionals, were asked to consider the social, economic, and ethical consequences of their work. In the fall of 1964, the University and the National Science Foundation provided \$70,000 to establish an experimental, "real world" laboratory course that was offered to advanced undergraduates. Students in Physics 303 and 304 were given problems that had no clear solutions--or perhaps no solutions at all--and encouraged to devise their own methods of finding the answers. The equipment itself might pose problems; it often was not "built and adapted precisely to the experiment, as in more conventional labs," and needed to be rebuilt. As the students worked toward an answer, they would "have something not often enough achieved by undergraduates--the solution to a real problem obtained through their own ingenuity and library research."⁶⁰

That same year, Frederick Seitz relinquished his duties as Department Head in order to become Vice President of Research and Dean of the Graduate School. (Before he could assume his new role, however, he was appointed President of the National Academy of Sciences.) His replacement as Head, Gerald Marks Almy, had to face the issue of how the United States' involvement in the Vietnam War--suddenly escalated in 1965--would affect the Physics Department, in both the short and long terms. In the short term, the Selective Service Act reduced the number of young men able to go on to graduate study by drafting them into the military, which in turn made enrollment and space planning difficult. Moreover, both the war in Vietnam and the "war on poverty" would "remove a large fraction of the federal support of graduate education (through support of research) in engineering and physical science," as funds were diverted to new priorities. In the long term, the rebellious, questioning climate of the 1960s forced the sciences to re-examine their role in society. Professor Almy wrote in 1967:

National interest and student interest are shifting to problems that do not require for solution new fundamental advances in science and engineering as much as application of present knowledge to situations complicated by human and political factors.

He went on to ask, "What is the role of and demand for physics and engineering under the new conditions of interest and social values?" Such questions would trouble the entire campus for many years, and in some ways, their answers would significantly alter the teaching and research approaches of the Physics Department.⁶¹

It was during this era that the Department modified slightly Wheeler Loomis's policy of "doing physics for physicists." The reader will recall that one of Dr. Loomis's first acts as Department Head in 1929 was to make the Colloquium lectures more technical and to discourage non-physicists from attending them; he also made the hiring of first-class researchers, in the most advanced and modern fields of physics, his top priority. This is certainly not to imply that Loomis

disdained the value of teaching--but one wonders what his response would have been to the demands for "relevance" in physics courses!

Yet by the late 1960s and early 1970s, students and professors had grown increasingly self-conscious about their roles and responsibilities. The campus became home to many conferences, "teach-ins," and lectures that explored the relationship between society and science. The Physics Department "put new emphasis on problems of society, upon communicating with nonscientists, and upon broadening the professional training offered." This meant, among other things, adding a course in "Physics and the Modern World," taught by Professor David Lazarus for nonscientists and very popular on campus. This course, first offered in 1973, is an attempt to "bridge the two-culture gap" by covering "basic philosophical concepts in physics which pervade all human disciplines--model-making, dynamics, ensemble behavior, symmetry." Soon after, the Department added "How Things Work--A Course for Nonscientists," which teaches students the basic physical laws behind such things as musical instruments, photography, television, and motors, and "Topics in Environmental Physics," which was "dedicated to the proposition that an understanding of these basic principles is relevant to the nonscientist citizen." This resulted in the publication of the text entitled, Practical Physics: How Things Work. By 1976, students could also choose "Physics of Photography," and by 1986, "Nuclear Weapons, Nuclear War, and Arms Control," which was "designed to assist students in making informed judgments about nuclear armaments and arms control."⁶²

The Department of Physics also moved to open at least some Colloquium presentations to the general University community. While most lectures continued to be of interest principally to physicists, no doubt it was a more diverse audience who came to hear Edward Teller speak on "Secrecy and the Open Society," University of Illinois Professor Paul Handler on "Neither War nor Pestilence nor Famine Will Halt the Population Explosion," or J. A. Duffie on "Solar Energy--and Energy Research--Its Past, Problems, and Prospects," all in 1970; in November 1971, L. M. Branscomb spoke on "Research as an Instrument for Social Change"; and in May 1973, Sidney D. Drell delivered a talk entitled "The Nuclear Arms Race: progress and Prospects at SALT." The

idea of blending technical with general-interest lectures has continued, with scientists speaking on environmental and energy issues, ethical problems facing the researcher, and nuclear war. The 1990-1991 centennial Colloquium series has maintained that practice.

Throughout the 1960s and 1970s, physicists at UIUC continued to improve and expand their traditional areas of research. In June 1962, the Materials Research Laboratory (MRL) was established as "an interdepartmental and interdisciplinary laboratory of the College of Engineering." The MRL was principally the work of Frederick Seitz, then Head of the Physics Department, and Physics was heavily represented in its early administration. Professors Seitz, R. J. Maurer, and John Bardeen were all on the first steering committee; Maurer was its first Director; George Russell of Physics was the Associate Director; and Ralph Flora, the Physics Department's first Business Manager, was also Business Manager of MRL. The Materials Research Laboratory, which is housed in a 1963 building attached to the Loomis Laboratory of Physics, was created to "conduct a program of experimental and theoretical research on the mechanical, electrical, optical, and magnetic properties of solids and liquids." In the early 1970s, the administration of MRL was more clearly divided from the Physics Department; henceforth the Director would report to the Dean of the College of Engineering rather than to the Physics Department Head, though the two institutions continue to work together closely.⁶³

The University of Illinois Department of Physics also found itself the host of an increasing number of national and international conferences. Professor Hans Frauenfelder organized an informal, closed meeting of physicists working on recoilless resonance absorption; the "Mossbauer Absorption Conference" was held at the University's Allerton Park on June 5-7, 1960. On October 11-13, 1965, the International Color Center Symposium was held at the University. This meeting emphasized the theoretical aspects of the field and included sessions on the band structure of the ionic crystals, the electron spin resonance studies of color centers, and the influence of external perturbations upon electron excess centers. About 300 people attended. On May 26 and 27, 1967, Illinois hosted the Midwest Conference on Theoretical Physics. Leo P.

Kadanoff chaired the program, which was attended by well over 100 researchers.

For years, the High Energy Physics Group in the Department had availed itself of the services of the University's computers, just as most researchers did. The HEPG was the largest single user of the IBM and ILLIAC I & II on campus, and its needs were highly specialized. In 1966, Professors Goldwasser and Ascoli began to discuss the possibility of purchasing a computer for the group's use alone. Buying a new computer never became practical, so in late 1966, negotiations began with the Coordinated Science Laboratory (CSL) to provide computer services. In June 1967, the CSX-1 computer was moved from CSL to the Physics Building. Designed by Professor Richard Brown, who later joined the Physics Department along with his computer, the CSX-1 was one of the first computers to be partially designed by another computer, in this case by the ILLIAC II.

One year later, HEPG began to make plans for the DOLLY project. DOLLY was a film measuring system designed to speed up and reduce the costs of measuring and processing bubble chamber photographs of nuclear events. DOLLY was designed by Professor Richard Brown and engineers Robert Downing, Dennis Zander, and Vaidotas Simaitis of the HEPG. In 1970, the CSX-1 was attached to the DOLLY computer; the system continued its work until 1981, when it was dismantled. It had measured more than 1.2 million "good events" by the time it retired.⁶⁴

Amid the prosperity of the decade, troubled times were ahead. For the most part, the Physics Department conducted business as usual, although it never forgot that as times changed, it must change, too. In 1967, the Office of Naval Research and the National Science Foundation announced that they were withdrawing their funding of the 300 MeV betatron. This cutback was part of a general budget squeeze in research funds, perhaps because, as Professor Almy had anticipated, money was being diverted from pure research to other national needs, such as the War on Poverty. Also, the research branches of the armed services, such as the Office of Naval Research, were pressured to fund only those projects that had immediate military applications; other government agencies, such as the National Science Foundation and the National Institutes of Health, would eventually take up the slack. Finally, the

feeling at NSF was that the 300 MeV machine "was no longer capable of competing with more modern machines." The Physics Department recovered quickly from the announcement, however: on June 1, 1968, it received \$500,000 from the National Science Foundation to build a 30 MeV superconducting linac, the energy source for a new 67 MeV microtron.⁶⁵

In late 1969, the world's largest Betatron was disassembled. The Cyclotron, too, was soon to end its usefulness, for later that spring the Office of Naval Research discontinued its financial backing for the proton accelerator. Once again, significant federal budget constraints had impacted the research activities of the Department of Physics. Both accelerators were dismantled and their spare parts, such as copper wire, sold to offset the cost of the shutdown. The Betatron Laboratory itself remains in service; having gone through numerous facelifts and adaptations, it is now known as the Nuclear Physics Laboratory. The Microtron Using Superconducting Linac (MUSL), which was upgraded from 67 MeV to 100 MeV in 1986, began to reduce its operations in 1988. That was the year the NSF declined the University of Illinois' request for funding to build a 450 MeV microtron. Since then, nuclear physicists at Illinois have worked in a "user mode," travelling to facilities around the world to conduct their research.⁶⁶

Another facet of the great changes taking place in the 1960s, the civil rights movement, drew attention to more than just voting rights for blacks. A new national concern about the lack of minorities (and, later, women) in the physics profession prompted many universities and private companies to begin searches for qualified minority physicists. In response to this concern, the University initiated a Special Educational Opportunity Program for minority students in 1968; under this program, three faculty members in the Department assumed extra responsibility for the handful of black undergraduate physics majors at Illinois, offering them special tutoring and guidance if necessary. Also, individual professors wrote to their friends and colleagues around the nation, asking them to be alert for promising black undergraduates who might be interested in coming to Illinois for graduate study. "The Department of Physics recognizes the immediate importance of education for the culturally deprived," said a draft resolution from April 1968. "We are anxious to contribute to the formulation and implementation of

programs to meet the special needs of this group of students." Though the resolution was set aside by the faculty, a motion that Professor Almy appoint a committee to consider the subject unanimously carried. That committee operated from 1968 to 1974.⁶⁷

Beginning in the late 1960's, a group of well-known theorists, who had been studying the behavior of the liquid heliums, turned much of their attention to related properties of highly dense matter found in stars. Professors G. Baym, D. Pines, V. Pandharipande, C. J. Pethick, F. K. Lamb, and others began to explain, and to predict, the behavior of neutron stars or pulsars. The research of these metamorphosed theorists made a significant impact on the field of astrophysics.

The decade of the 1970s began with the retirement of Gerald M. Almy as Department Head. Professor Almy, who died in 1977, should be remembered especially for his service to the Department of Physics and to the University. During his forty years at Illinois, he served as Acting Head, Associate Head, and Head of the Department; he was Chairman of the University Study Committee on Future Programs from 1957 to 1962; and after his retirement, he acted as Chairman of the Program Evaluation Committee of the College of Liberal Arts and Sciences. He supervised the writing of nineteen doctoral dissertations, ran the betatron program in D. W. Kerst's absence, wrote a history of the Department in 1968, and made contributions to research in photonuclear processes and the spectroscopy and fluorescence of molecules. He is remembered by his colleagues as "a man of very sunny and pleasing disposition," who possessed "astute judgment and fine managerial abilities." His replacement was a man who has spent virtually his entire scientific career at Illinois: Ralph O. Simmons.⁶⁸

In the early 1970s, as the U.S. presence in Vietnam escalated, and as the student protest movements gained strength and numbers on campuses throughout the nation, the University of Illinois saw its share of marches and strikes. The U.S. invasion into Cambodia was the spark which ignited student unrest across the nation. The University of Illinois was no exception to the wave of anger. In early May, student activists in Champaign-Urbana planned a campus-wide strike to protest the war. On May 10, hundreds of people gathered on the Quadrangle and listened to talks by activists.⁶⁹

At about the same time, a group of physics faculty and graduate students met to develop a "statement of concern and protest on issues motivating the strike." The group of physicists, who did not claim to speak for the Department, expressed sympathy for the strikers' goals but urged moderation. "We support the strike on our campus as a humanitarian protest against inhumanity," said the statement, "and in so doing we express our firm opposition to violence and provocation in all forms and on all sides." Nearly 150 faculty, staff, and graduate students of the Department signed the statement. A committee chaired by Professor Michael Wortis and including Professors Myron B. Salamon, Ulrich Kruse, Thomas O'Halloran, and Albert Wattenberg, was appointed by Professor Almy to be in charge of "organizing and/or calling attention of physics students to issues and activities related to the purposes of the strike."⁷⁰

The 1972 and 1973 Nobel Prizes in Physics were of special interest to the University of Illinois Physics Department. In 1972, John Bardeen shared the prize in physics with Leon Cooper, who had been a research associate at Illinois, and J. Robert Schrieffer, who had been one of his graduate students, for developing the "BCS" theory of superconductivity in certain metals. Dr. Bardeen thus became the first person to win the same Nobel Prize twice. He had, in his nearly forty years at Illinois, become the Physics Department's most decorated member. His resume included the Fritz London Award, the Medal of Freedom, the Presidency of the American Physical Society, the Stuart Ballantine Medal, and the Medal of Honor. He was the first United States citizen to receive the Lomonosov Award of the Soviet Academy of Sciences. He was also the recipient of the Third Century Award honoring exceptional contributions to American creativity as part of the 200th anniversary of the U.S. Patent and Copyright Laws, and was recognized by Life magazine as one of the 100 most influential people of the 20th Century. Years later, in October, 1989, the Sony Corporation endowed a \$3,000,000 John Bardeen Chair in the Department of Physics and the Department of Electrical and Computer Engineering at the University of Illinois at Urbana-Champaign. This is the largest single donation ever made by the Sony Corporation to a United States university.

The dust had scarcely settled from the excitement of the 1972 prize when the announcement came that Brian David Josephson, a research associate professor at Illinois from 1965 to 1966, would share the 1973 Nobel Prize in Physics. Dr. Josephson, who has spent most of his career at Cambridge University, was only a twenty-two-year-old graduate student when he did the work that earned him the prize. The Academy cited him for his theoretical predictions of the properties of supercurrent through a tunnel barrier--the so-called "Josephson effects."⁷¹

In the same year that Professor Josephson won his Nobel Prize, U.S. involvement in the Vietnam War officially ended--on August 15, 1973. With the easing of that conflict came the first hints that the Cold War might be warming. When President Richard Nixon established diplomatic relations with Communist China, a rush of cultural and scientific exchange programs ensued. The United States Committee on Scholarly Communication arranged a number of visits from Chinese scientists and intellectuals, including a delegation of physicists that visited University of Illinois in April 1975. The group, headed by Shou-wu Wang, studied American work in crystal growth and crystal structures, semiconductors, solids under high pressures and high temperatures, and magnetic materials and their applications.⁷²

A measure of the international prestige attained by the Department of Physics was its winning, in 1982, a university-wide competition for the University of Illinois' John D. MacArthur professorship. The University of Illinois had received a \$1.2 million grant from the John D. and Catherine T. MacArthur Foundation to establish an endowed chair; fourteen departments were asked by the University to submit proposals for candidates. The Physics Department's nominee, Anthony J. Leggett, was regarded by the selection committee as "the outstanding person among all the candidates." Professor Leggett's research interests include the properties of superfluids and the characteristics of tunnelling phenomena, especially as they do--or do not--satisfy "basic assumptions commonly made about the validity of canonical quantum theory." Professor Leggett, whom John Bardeen called a "world leader in the theory of low-temperature physics," came to Illinois from the University of Sussex, England.⁷³

Throughout the 1970s and 1980s, the Department of Physics carried on its service to the world's scientific community by continuing to host national and international scholarly conferences. A number of symposia were held over the years for Dr. John Bardeen, the Department's two-time Nobel Prize winner, on the occasions of his 60th, 75th, and 80th birthdays, as well as a special festschrift entitled "Frontiers in Condensed Matter Physics," on October 12-14, 1976. These informal and light-hearted symposia offered tributes to Dr. Bardeen, sing-alongs (with appropriate lyrics), and even, in 1968, a John Bardeen Golf Tournament. But these symposia were also scholarly meetings, where talks by scientists from around the world--including Nobel Laureate J. Robert Schrieffer and L. P. Gor'kov of the Landau Institute, Moscow--emphasized Dr. Bardeen's ideas and influence on their own work.

Other important conferences during this period included a "U.S.-Japan Seminar on Recombination-Induced Defect Formation in Crystals," organized by F. C. Brown of Illinois and Noriaki Itoh of Nagoya University, Japan. Forty participants, from the United Kingdom, Germany, Italy, Spain, and Canada, as well as the United States and Japan, visited the University of Illinois on June 2-5, 1982, in order to conduct a "critical survey" of current research and to explore the possible applications of "recent developments in instrumentation," such as high-speed timing techniques.⁷⁴

The 1980s also saw important conferences hosted by the University of Illinois in the areas of "Internal Friction and Ultrasonic Attenuation in Solids" (June 3-6, 1985), organized by Dr. A. V. Granato of Physics and Dr. C. A. Wert of Mining and Metallurgy, and attended by 160 scientists from seventeen countries; "Phonon Scattering in Condensed Matter" (June 2-6, 1986), co-chaired by Professors A. C. Anderson and J. P. Wolfe, and attended by 125 scientists from fourteen countries; and a special symposium to celebrate the thirty-fifth anniversary of the seminal experiment in electron scattering conducted by Professors E. M. Lyman and A. O. Hanson at the University of Illinois. This 1951 experiment sampled the distribution of electric charge in gold, aluminum, and copper nuclei; its birthday celebration, held on October 23 and 24, 1986, focused on "trends in both the experimental and theoretical side of electron scattering studies." Finally, a surprise

sixty-fifth birthday symposium was held in honor of Professor Hans Frauenfelder on May 1-3, 1987. Speakers at the symposium included Nobel laureates Rudolf Mossbauer and Manfred Eigen, as well as Irwin Gunsalus, Charles Slichter, Peter Wolynes, Harry Drickamer, David Pines, and Anthony Leggett from Illinois.⁷⁵

Developments in international science were exciting, but matters closer to home needed attention, too. In the late 1970s and early 1980s, the physics profession began to take a close look at the status of women in physics. While women had made considerable gains in many traditionally male occupations, they still were--and are--grossly underrepresented in the sciences. The Department at Illinois had boasted a woman PhD, Eleanor Frances Seiler, as early as 1922, but not one woman was able to repeat the accomplishment for over twenty years. The second woman PhD, however, could serve as a very worthy role model indeed: Rosalyn Sussman Yalow, PhD 1945, was awarded the 1977 Nobel Prize in Medicine and Physiology for the discovery and development of radioimmunoassay, a "technique which employs radioactive isotopes to detect and measure the levels of insulin and hormones in the blood and body tissues." After 1945, the number of women receiving PhDs in physics at Illinois increased slowly. In the 1980s, one or two PhDs were conferred each year.⁷⁶

Doubtless, though, the opportunities for women have improved. The Illinois Physics Department--and the profession in general--has come a long way from the 1930s, when female graduate students were in charge of preparing and serving refreshments to their male colleagues at Colloquium, or even from the late 1960s, when a University "nepotism" rule prohibiting the employment of spouses kept many women from receiving faculty positions or assistantships. Awareness of the problem has improved steadily since the mid-1970s, and the Department at Illinois has made some efforts to increase opportunities for women in physics. In 1982, Associate Professor Laura Eisenstein argued before an APS meeting that more women should be encouraged to study physics, and that women who have already chosen careers in physics must be assured of equal opportunities for advancement. After Professor Eisenstein's death in 1985, the Department and APS joined her family and friends in

establishing the annual Laura Eisenstein Award for the outstanding woman student in physics at Illinois.⁷⁷

In November 1981, the American Physical Society and the American Astronomical Society together established a Panel on Academic Positions for Women Astronomers and Physicists; this panel was chaired by Department Head R. O. Simmons in 1982 and 1983. In the March 1982 issue of *Physics Today*, Professor Simmons wrote that the panel's objective was to "identify women physicists who possess the necessary talents and experience in research and teaching, but whose careers have been turned away from academia in the past." As women found faculty jobs, they would in turn act as role models for female students. "As a result," Simmons wrote, "we can expect that increased numbers of women will participate in physics and its applications, and more men will grow up in a setting that assumes and includes such participation."⁷⁸

Throughout the 1980s, Illinois continued to increase its involvement in computer design, development, and implementation. In December 1984, the Center for Supercomputing Research and Development was established to build the "Cedar" supercomputer, "a prototype shared-memory multiprocessor that consists of clusters of eight processors." Around that time, faculty members from Physics and other departments at the University of Illinois wrote a proposal for a supercomputing center to be located at Urbana-Champaign. In February 1985, the National Center for Supercomputing Applications was established with a five-year, \$43.9 million grant from the National Science Foundation. Total federal, state, and private sources of support for NCSA would total \$75 million by 1990. NCSA's purpose is to provide supercomputers for research in such areas as predicting tornadoes and wind shears, analyzing urban traffic patterns, and studying the fundamental interactions of atomic particles. The Director of NCSA, Larry L. Smarr, is professor of physics and astronomy at Illinois.⁷⁹

The federally-funded Strategic Defense Initiative (SDI), commonly called "Star Wars," became a controversial topic in 1987, both nationally and on-campus. Faculty members of the Department of Physics became actively involved in this issue. Professor Jeremiah Sullivan, director of the campus Program in Arms Control, Disarmament, and International Security arranged for a public forum to include the Chief

Scientist of the U.S. SDI office and the Director of the U.S. Energy office to discuss the Star Wars program. Professors John Kogut and Michael Weissman, among other faculty members, challenged the Star Wars concept, actively promoting local and national petitions against the program.

In 1986, Department Head R. O. Simmons decided to return to teaching and research in the areas of defects in solids, the properties of noble gas crystals, and quantum solids and liquids. "To the extent to which we are a great department," commented Professor David Lazarus upon Professor Simmons' retirement as Head, "it is as a result of having great and good administrators. Ralph Simmons...is a direct cause for our department's still being a world-class institution in 1986." Since he joined the Department's faculty in 1959, Professor Simmons has directed the doctoral theses of twenty graduate students--most of them during his tenure as Head.⁸⁰

Ralph Simmons's place as Head was assumed by Ansel C. Anderson who, like his predecessor, earned his PhD at Illinois. Dr. Anderson's thesis on thermal conductivity in liquid helium was supervised by Professor J. C. Wheatley in 1961; since then, he has directed the research of over twenty students and has authored over 200 papers in low temperature physics. Dr. Anderson will step down as Department Head in 1991--coinciding with the end of the first 100 years of the Physics Department at the University of Illinois.

That 100 years represents a century of service, to the University, to the state, and to the nation. The Department of Physics can be proud of the contributions it has made over that century to the advancement of science and to the education of generations of students. The contribution of the Department to undergraduate education is virtually beyond measure, though it is certain that tens of thousands of bachelor's degrees requiring physics have been granted. From June 1910, when the Department awarded its first doctoral degree, to December 1990, over 1300 men and women have received PhDs in physics. In 1988, 1059 of them were still active in teaching and research in every state in the union; 116, or 11%, were working in the state of Illinois.⁸¹ On the postdoctorate level, the University of Illinois is one of the largest and most culturally diverse educational institutions in the country.

New PhDs from around the world spend, typically, two years as Research Associates, working closely with a university professor to develop their "knowledge of a field of physics and [their] ability to do independent research." From 1945 to 1975, the last year compiled figures were available, the Physics Department had trained about 475 "postdocs," many of whom went on to join the regular teaching faculty.⁸²

The Department has also acted in service to the University of Illinois. We have seen how, since the late 1960s, the weekly Colloquium lectures were often directed to the general university community, in order to give physicists' perspectives on important national and international scientific issues. On a practical level, Physics manufactures liquid helium for the use of scientists doing low-temperature research in departments and laboratories all over campus. The Department of Physics has also been outstanding in its efforts to develop interdisciplinary programs, designed to make the most of various academic approaches and to bridge the gaps between different fields. In 1978, for example, Professor Gary Gladding of Physics and Professor David Bantz of Philosophy team-taught a course entitled "Space, Time, and Matter: Conceptions of Physical Reality," which was devoted to "the conceptual development and philosophical interpretations of the quantum theory"; students in both the sciences and the humanities considered "the kinds of answers that physics can provide to the question 'What is real?'" In recent years, the Laboratory for Fluorescence Dynamics (largely the creation of Professor Enrico Gratton) opened in Loomis Laboratory for the use of between 50 and 200 visitors annually, and in 1989 Professor Miles Klein of Physics was named Director of the new Science and Technology Center for Superconductivity Research, a five-institution consortium funded by the National Science Foundation and the State of Illinois headed by the University of Illinois.⁸³

In addition, the Department of Physics has devoted itself to the larger academic community, as evidenced both by the number of national positions occupied by members of its faculty and by the number of awards heaped upon it by outside institutions. Beyond those already mentioned, it is quite simply impossible to list all these positions and awards. Accordingly, we cite a few of the more recent ones. Professor Edwin Goldwasser, for example, served from 1967 to 1978 as the Deputy Director

of Fermi National Accelerator Laboratory; in 1980 David Lazarus was chosen as editor-in-chief of the American Physical Society; David Pines was awarded the Dirac Medal for the Advancement of Theoretical Physics in 1985; Hans Frauenfelder was elected as chairman of the Governing Board of the American Institute of Physics in 1986; and Charles P. Slichter is currently Director of the Polaroid Corporation and the senior fellow of the Corporation of Harvard University. The contributions of the Physics Department to engineering and science have been recognized fifteen times since 1965, through Engineering College Alumni Awards presented to physics graduates who have excelled in their fields, both inside and outside academia.

The Physics Department itself has instituted a number of awards, designed to recognize outstanding achievements by its students and faculty and to encourage others to match their accomplishments. The E. M. Lyman fund, established at the time of Professor Lyman's retirement in 1974 and first presented in 1975, recognizes an outstanding undergraduate physics major; a similar award for women was established in the name of Professor Laura Eisenstein in 1985, to be given to the outstanding woman undergraduate. Dr. Scott Anderson, who received his PhD at Illinois in 1940, helped to establish the award later named after him; this award, presented by the Physics Alumni Association, has been given to the Department's outstanding teaching and research assistants each semester since 1983. The Peter Axel Memorial Lecture series was begun in 1984 as a tribute to Professor Axel's "lifelong interest in outstanding physics and in the clear presentation of physics to scientific audiences." During each academic year, a colloquium on a nontraditional physics topic is presented in honor of Professor Gerald M. Almy in recognition of his profound interest and concern for graduate education. This Colloquium is funded in part by the Gerald M. Almy Memorial Fund of the University of Illinois Foundation. The William L. McMillan Memorial Award was begun in 1985 and is given to a young theoretical or experimental condensed matter physicist, who is also asked to deliver a lecture to the Department. The Felix T. Adler Fellowship in Physics was created in memory of longtime faculty member, Professor Felix Adler and is awarded annually to an outstanding student in Nuclear Physics. The Jordan S. Asketh Fellowship is awarded each

year to a Greek citizen who is a graduate of the Universities of Athens, Crete, or Thessaloniki, or the Polytechnic of Athens who have displayed excellence and originality in various scientific fields, and who are pursuing an advanced degree at the University of Illinois at Urbana-Champaign. Finally, the Renato Bobone Italian Graduate Student Award was established in 1985 and is presented "to a physics graduate student who is a citizen of Italy and demonstrates academic excellence." Dr. Bobone, who received his PhD from Illinois in 1940, says the award should be regarded "as another bridge between countries already joined by many ties of people, culture, and friendship."⁸⁴ Through such awards as these, the Department of Physics recognizes and promotes continuing contributions to education and research in the science of physics. As the Department of Physics enters its second century, a special Century II Colloquia Endowed Fund has been established by our alumni in the University of Illinois Foundation to bring top scientists of international renown to the Urbana-Champaign campus to present new and exciting ideas to keep the Department at the forefront of science.

In the vast span of history, a mere 100 years seems insignificant. But when one walks across the campus of the University of Illinois, or through the hallways, laboratories, and classrooms of the Loomis Laboratory of Physics, one is struck by the tremendous changes that have occurred since 1890. The first building to house the Physics Department, University Hall, no longer exists, replaced by the sprawling Illini Union in 1940. Imposing old Engineering Hall and the Metallurgy and Mining Building, the next two homes of Physics, still stand, weathered stone and roughened brick, against the tropical summers and arctic winters of Illinois, a reminder of a not-so-distant past. Loomis Laboratory itself, now thirty years old, seems ageless, combining the architectural style of a generation ago with the most sophisticated computer and laboratory equipment available. The sunny corridors of the lobby outside the main lecture rooms, the main classroom corridor and the stairwells contain a variety of memorabilia from bygone days. The 1990-1991 school year marks the beginning of the second century of physics. Who can say what unimaginable developments, revolutionary changes, and comforting continuities will greet the celebrants of the second centennial?

NOTES

The notation (DPF) following a reference indicates that the material is located in the inactive files of the Department of Physics at the University of Illinois at Urbana-Champaign. The University itself is abbreviated UIUC throughout the notes.

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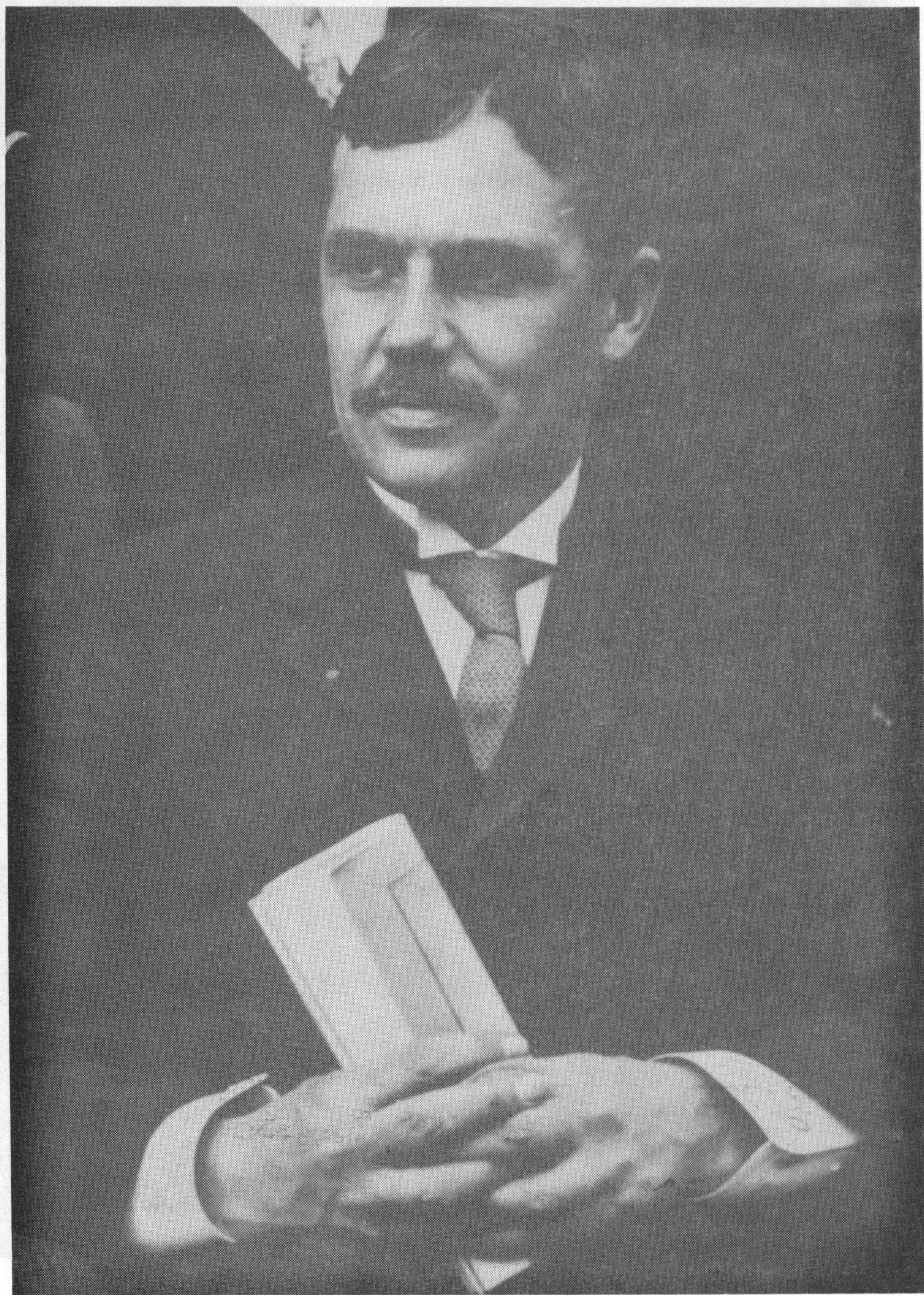
PHYSICS DEPARTMENT HEADS

PHYSICS DEPARTMENT





Samuel Wesley Stratton
1890 - 1892



Albert Pruden Carman
1896 - 1929



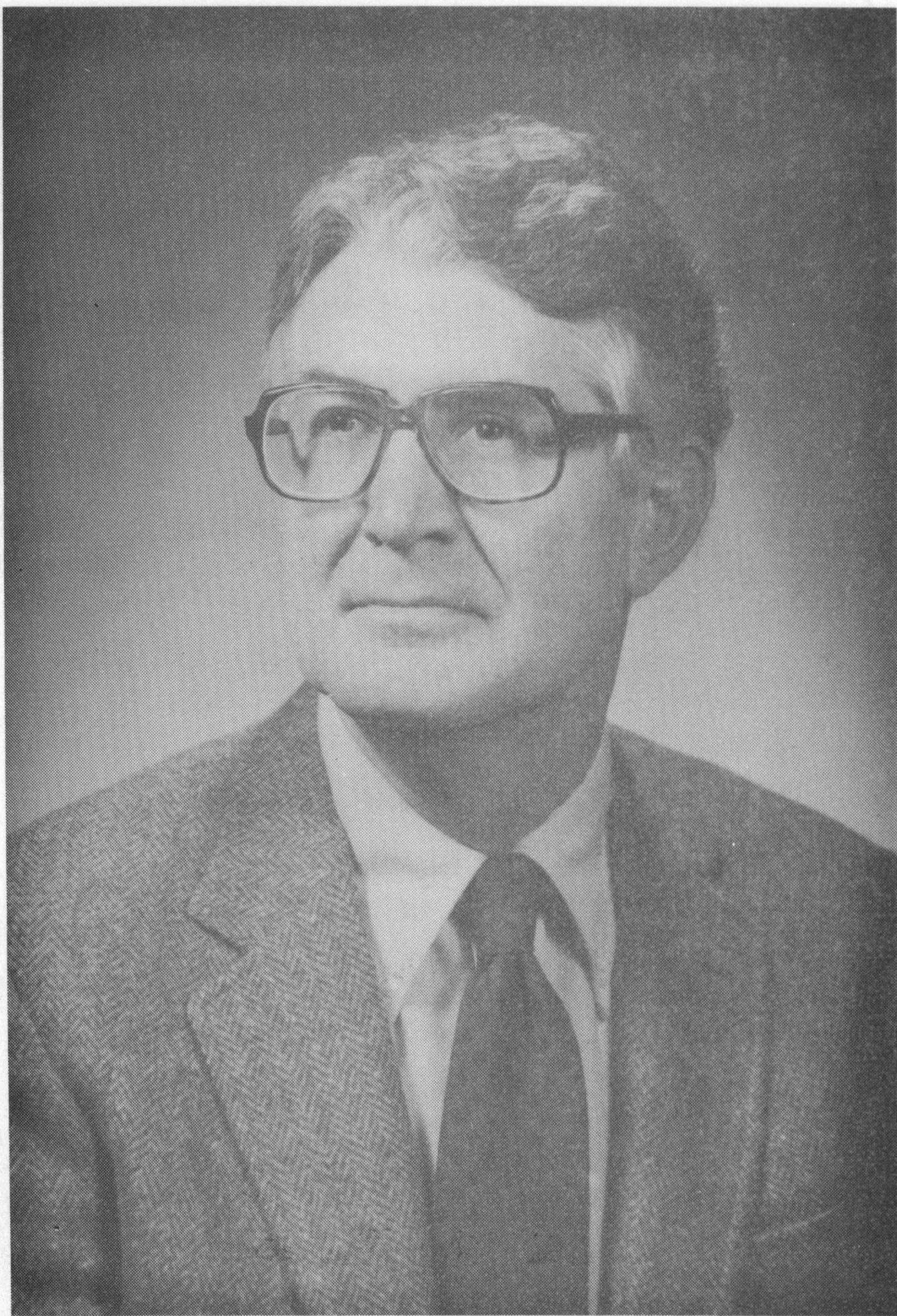
Francis Wheeler Loomis
1929 - 1957



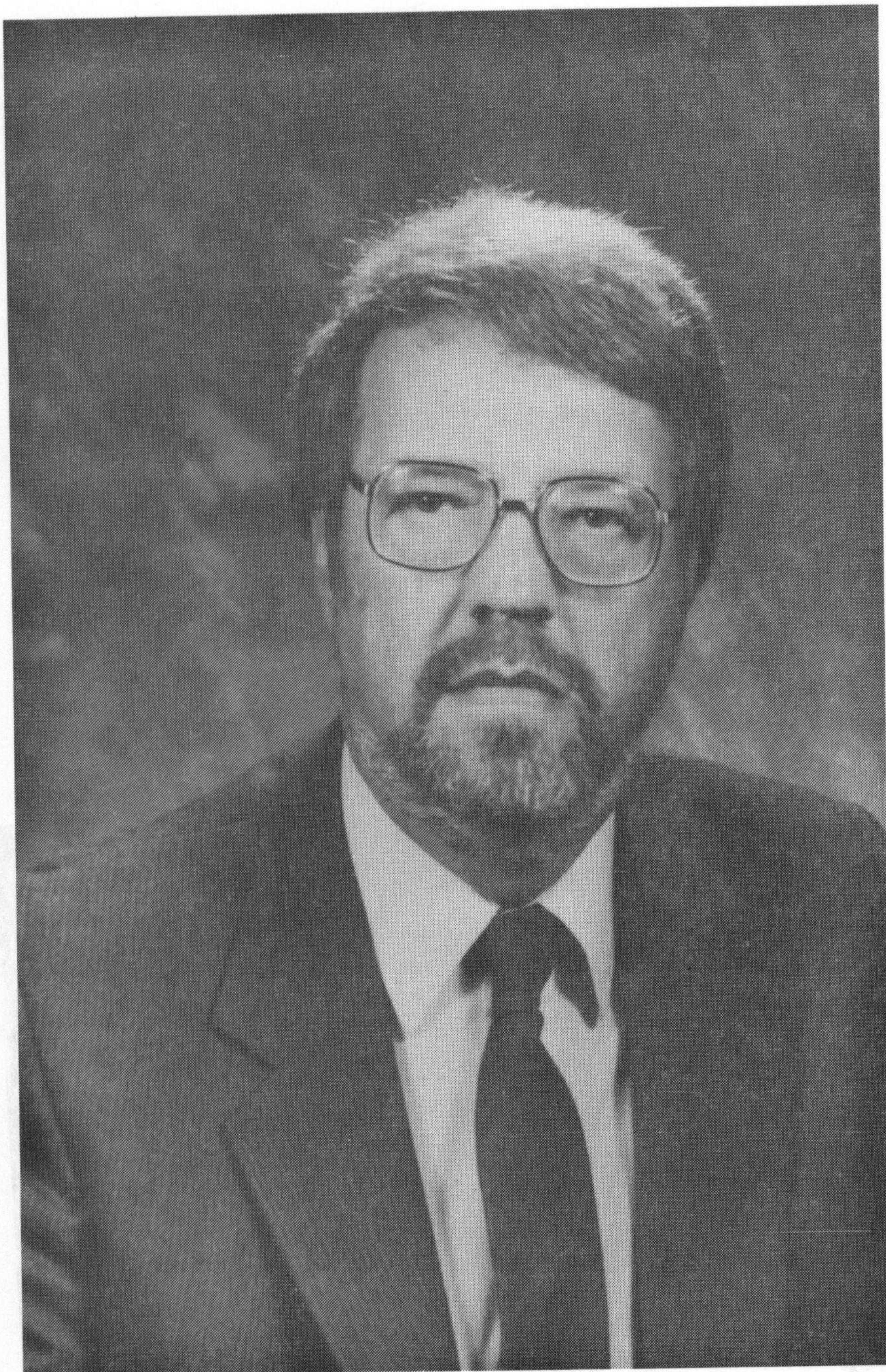
Frederick Seitz
1957 - 1964



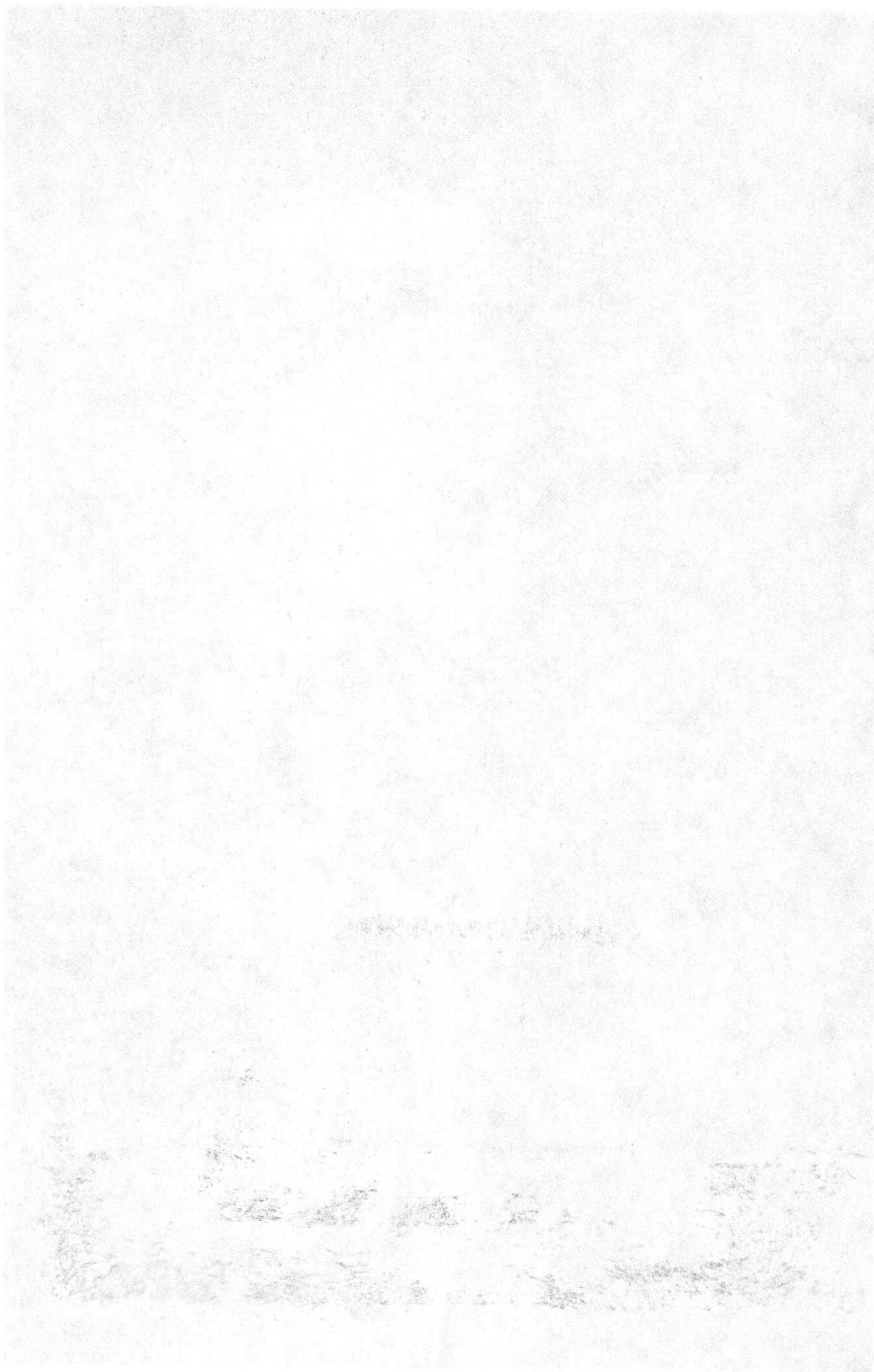
Gerald M. Almy
1964 - 1970



Ralph O. Simmons
1970 - 1986



Ansel C. Anderson
1986 - 1991





PHYSICS NOBEL LAUREATES

Polykarp Kusch

1955

(with Willis E. Lamb)

For his precise determination of the magnetic moment of the electron

THE NEW YORK PUBLIC LIBRARY

ASTOR
LENOX
TILDEN





Polykarp Kusch

1955

(with William Lamb)

for his precision determination of the magnetic moment of the electron



Rosalyn Yalow
1977

for inventing the powerful and clinical research technique of radioimmunoassay

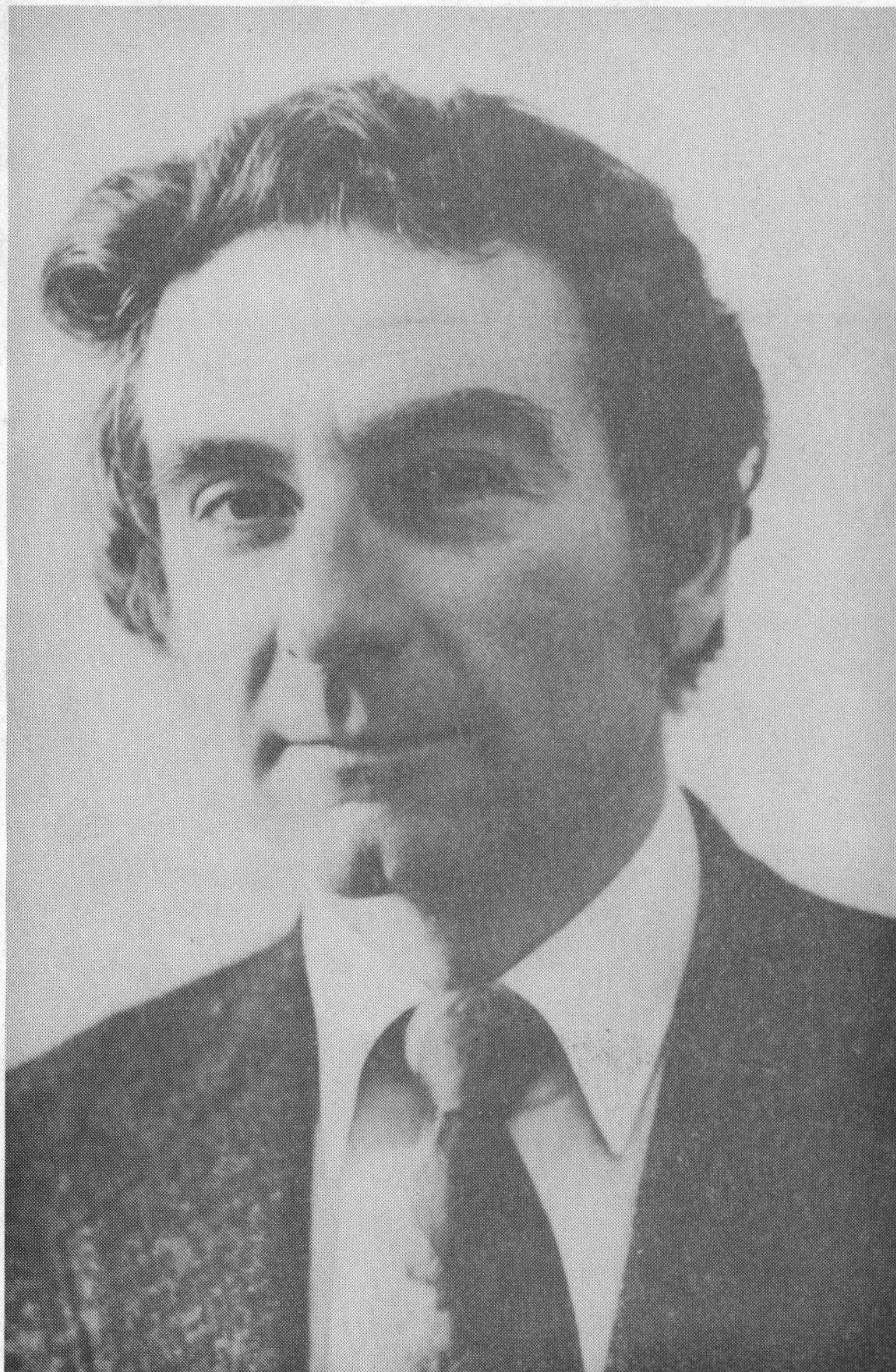


Brian D. Josephson

1974

(with Leo Esaki and Ivar Giaever)

for theoretical prediction of the properties of a supercurrent through a tunnel barrier

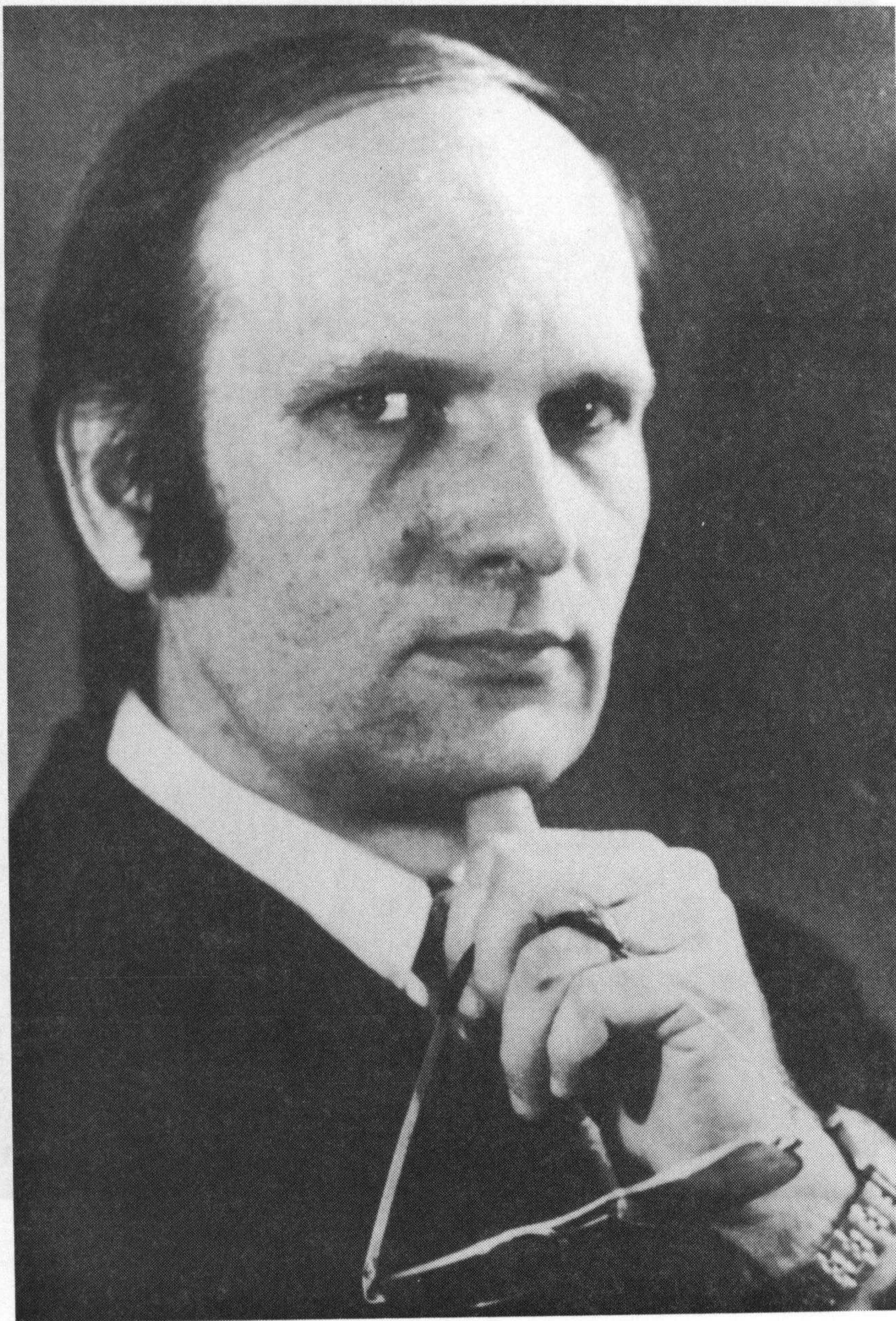


Leon N. Cooper

1972

(with John Bardeen and J. Robert Schrieffer)

for development of the theory of superconductivity



J. Robert Schrieffer

1972

(with John Bardeen and Leon N. Cooper)

for development of the theory of superconductivity



John Bardeen

1956

(with William Shockley and W. H. Brittain)

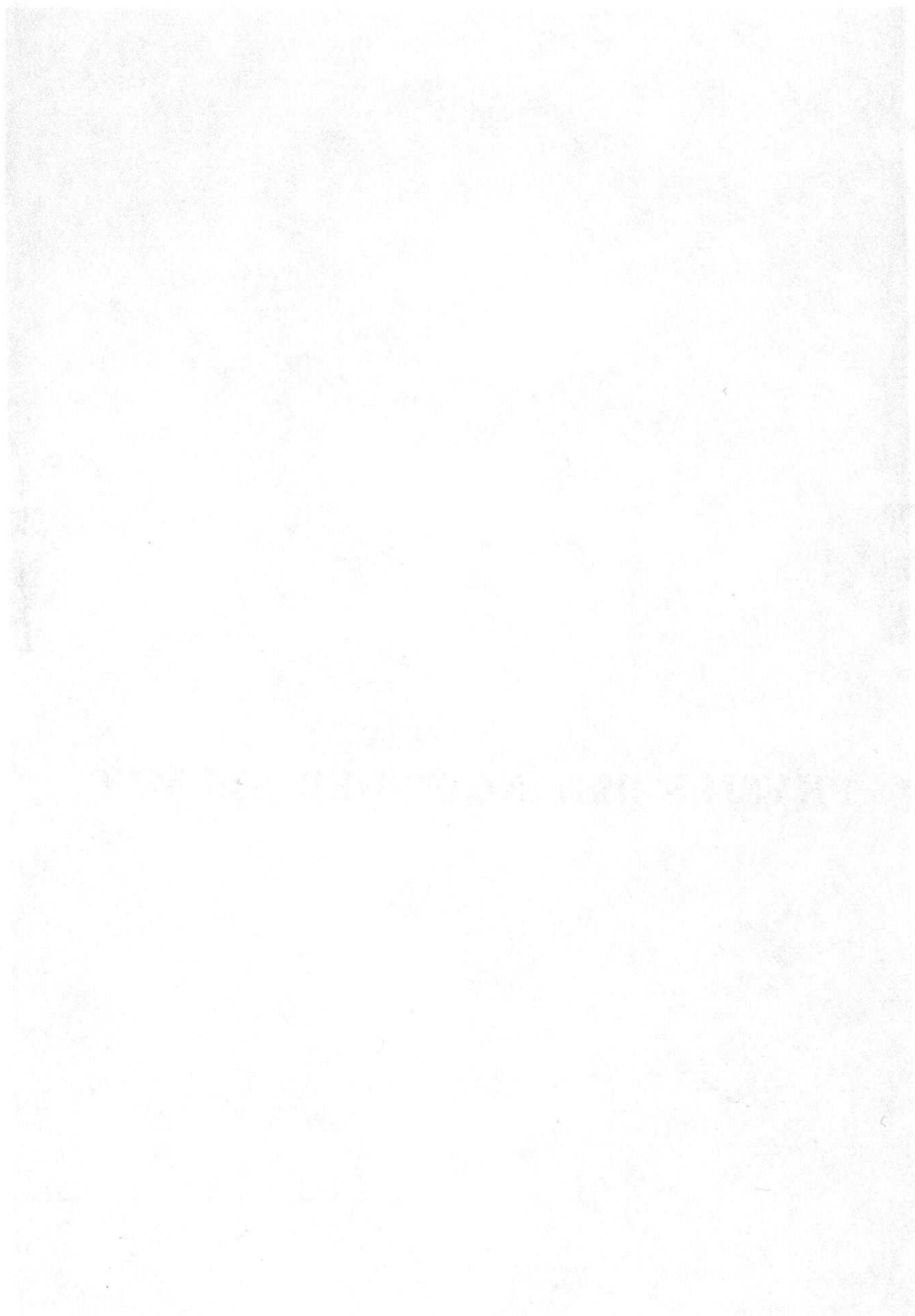
for research on semiconductors and the discovery of the transistor effect

1972

(with Leon N. Cooper and J. Robert Schrieffer)

for development of the theory of superconductivity

PHYSICS DISTINGUISHED ALUMNI





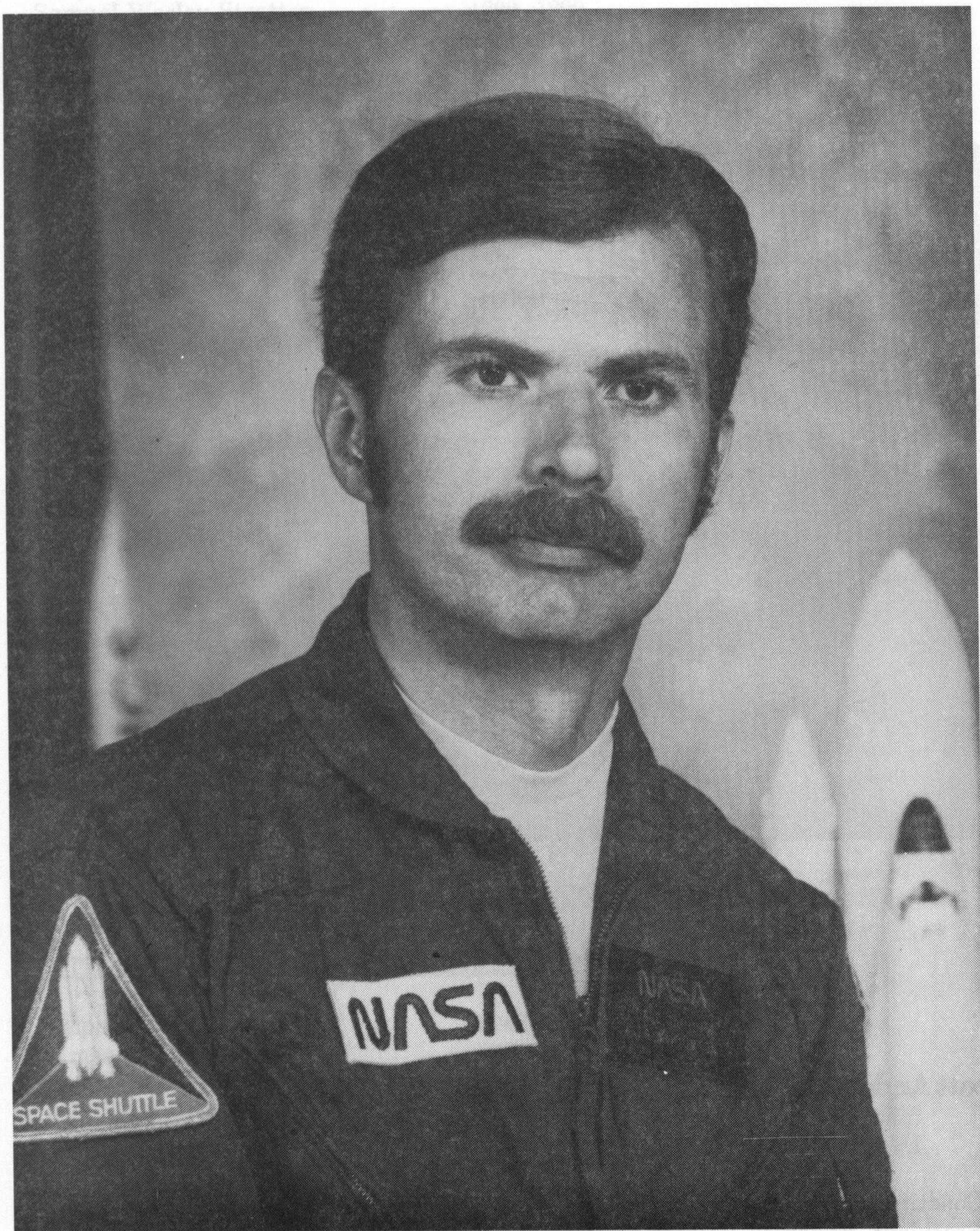
Lew Allen, Jr.

Director, Jet Propulsion Laboratory
Vice-President, California Institute of Technology
Chief of Staff, United States Air Force, 1978 - 1982
Thomas D. White National Defense Award
George W. Goddard Award of the Itek Corporation



Walter E. Massey

- Director of the National Science Foundation
- Vice-President for Research, University of Chicago
- Vice-President for Research, Argonne National Laboratory
- Past President and Chairman of the Board of Directors, American Association for the Advancement of Science
- Vice President, American Physical Society
- Member of the National Service Board, 1978 - 1984
- Distinguished Service Citation of the American Association of Physics Teachers, 1975



Dale A. Gardner

- First Illini in Space
- Member of Space Shuttle Challenger Crew, September 30, 1983 - October 5, 1983
- Member of Space Shuttle Discovery Crew, November 8, 1984 - November 15, 1984



Scott Anderson

(pictured on left, with UI Alumni Association President Jane Hayes Rader and UI President Stanley Ikenberry)

- Constituent Leadership Award, University of Illinois Alumni Association, 1989
- President, Anderson Physics Laboratory
- President, Physics Alumni Association, 1978 - 1984

PHYSICS DEPARTMENT HEADS

Samuel Wesley Stratton	1890 - 1892
Daniel William Shea	1892 - 1896
Albert Pruden Carman	1896 - 1929
Francis Wheeler Loomis	1929 - 1957
Frederick Seitz	1957 - 1964
Gerald M. Almy	1964 - 1970
Ralph O. Simmons	1970 - 1986
Ansel C. Anderson	1986 - present

PHYSICS DEPARTMENT ASSOCIATE HEADS

Gerald M. Almy	1952-1964
George A. Russell	1968 - 1974
Ernest M. Lyman	1970 - 1974
James H. Smith	1972 - 1980
Donald M. Ginsberg	1970 - 1972, 1977 - 1984
Manfred J. Raether	1980 - present

PHYSICS /ASTRONOMY LIBRARIANS

Leonard Coburn	1952 - 1954
Harry Skallerup	1954 - 1955
Margaret Runkel	1955 - 1965
Joseph Carman	1965 - 1967
Bernice Hulsizer	1967 - 1986
David Stern	1987 - present

PHYSICS BUSINESS MANAGERS/ASSISTANTS TO HEAD

Ralph Flora	1947 - 1970
James L. Pence	1970 - 1974
Raymond F. Borelli	1974 - present

PHYSICS DEPARTMENT HEAD SECRETARIES

Della Mae Rogers McCown	1912 - 1959
Bess Matteson	1959 - 1978
Mary Jane Palmer	1978 - present

PHYSICS CENTENNIAL COLLOQUIA SERIES

The Department of Physics at the University of Illinois at Urbana-Champaign proudly presented a series of Centennial Colloquia to recognize the past century of outstanding service delivered by the Department of Physics, as well as to inform the current students, staff, faculty and friends of the Department of those scientific, social, and political issues likely to be encountered as the Department enters its second century.

Crucial Steps in the Evolution of Science

Frederick Seitz

President Emeritus, Rockefeller University; President Emeritus, National Academy of Sciences; UIUC Physics Department Head, 1957-1964; Medal of the Franklin Institute, 1965; Vonnevar Bush Award of the National Science Board, 1983; Fellow, American Physical Society; Member, National Academy of Sciences; Member American Academy of Arts and Sciences; Member American Philosophical Society.

October 4, 1990

Radiation and Society

Rosalyn Yalow

Senior Medical Investigator, Veterans Administration, VA Medical Center, Bronx, NY; Professor Emeritus, Albert Einstein College of Medicine, Yeshiva University; Solomon A Berson Distinguished Professor-at-Large, Mt. Sinai School of Medicine, CUNY; Nobel Laureate, 1977; National Medal of Science, 1988; William S. Middleton Medical Research Award of the Veterans Administration, 1960; Alter & Lasner Award for Basic Medical Research, 1976; Science Achievement Award of the American Medical Association, 1977.

October 18, 1990

The Solar Neutrino Problem

John N. Bahcall

Professor of Theoretical Physics, Institute for Advanced Study, Princeton; Chairman, Astronomy and Astrophysics Survey Committee of the National Academy of Sciences; Warner Prize of the American-Astronomical Society, 1970; Fellow, American Physical Society; Member, National Academy of Sciences; Member, American Academy of Arts and Sciences.

October 25, 1990

Non-Linear Processes

Leo P. Kadanoff

Professor of Physics & Mathematics, University of Chicago; Wolf Prize of the Wolf Foundation, 1980; Oliver Buckley Prize of the American Physical Society, 1977; Boltzmann Medal of IUPAP Commission on Statistical Physics; Elliott Cresson Medal of the Franklin Institute; Fellow, American Association for the Advancement of Science; Fellow, American Physical Society; Member, National Academy of Sciences; Member, American Academy of Arts and Sciences.

November 8, 1990

Prospects for Elementary Particle Physics in the 21st Century

Roy F. Schwitters

Director, Superconducting Super Collider Laboratory; Professor of Physics, Harvard University; Alan T. Waterman Award of the National Science Foundation, 1980; Associate Editor, Annual Reviews of Nuclear and Particle Science; Fellow, American Physical Society; Fellow, American Association for the Advancement of Science.

November 15, 1990

Structure of the Hadrons
Annual Axel Memorial Lecture

Arkady B. Migdal

Professor, L. D. Landau Institute for Theoretical Physics, Moscow, USSR; Order of Lenin; Order of Red Banner of Labour; Member, Academy of Sciences, USSR.

November 29, 1990

High Temperature Superconductivity

J. Robert Schrieffer

Professor of Physics, Institute for Theoretical Physics, University of California at Santa Barbara; Nobel Laureate, 1972; Comstock Prize of the National Academy of Sciences, 1968; Fellow, American Physical Society; Member, National Academy of Sciences; Member, American Academy of Arts and Sciences; Member, Philosophical Society.

December 6, 1990

Exploring the Solar System

Lew Allen, Jr.

Director, Jet Propulsion Laboratory; Vice-President, California Institute of Technology; Chief of Staff, United States Air Force, 1978-1982; Thomas D. White National Defense Award; George W. Goddard Award of the Itek Corporation; Member, National Academy of Engineering.

January 17, 1991

Neural Computation

John J. Hopfield

Professor Chemistry & Biology, California Institute of Technology; Oliver E. Buckley Prize of the American Physical Society, 1969; Fellow, American Physical Society; Member, National Academy of Sciences; Member, American Academy of Arts and Sciences.

January 31, 1991

Science and Science Policy for the Millennium

Walter E. Massey

Vice-President for Research, University of Chicago; Vice-President for Research, Argonne National Laboratory; Past President and Chairman of the Board of Directors, American Association for the Advancement of Science; Vice-President, American Physical Society; Member of the National Science Board, 1978-1984; Distinguished Service Citation of the American Association of Physics Teachers, 1975; Trustee, Museum of Science and Industry; Fellow, American Academy of Arts and Sciences.

February 7, 1991

NOTE: This colloquium was cancelled due to Dr. Massey's appearance before the U.S. Senate confirmation hearings on his nomination as Director of the National Science Foundation.

Science Policy in the 1990's: Changing Issues and Changing Roles

Erich Bloch

Director, National Science Foundation, 1984-1990; Corporate Vice-President, IBM, 1981-1984; National Medal of Technology; Fellow, American Association for the Advancement of Science; Member, National Academy of Engineering.

February 21, 1991

Dark Matter, Large Scale Motion, and Other Mysteries of the Universe

Vera C. Rubin

Staff Member, Department of Terrestrial Magnetism, Carnegie Institution, Washington, DC; Member, Space Science Board of the National Academy of Sciences, 1974-1976; Chancellor's Distinguished Professor of Astronomy, University of California at Berkeley, 1981; Associate Editor, *Astronomical Journal*; Associate Editor, *Astrophysics Journal Letters*; Member, National Academy of Sciences.

February 28, 1991

Strange Properties of Matter

Robert C. Richardson

Professor of Physics, Cornell University; Simon Memorial Prize, 1976; Buckley Prize of the American Physical Society, 1981; Fellow, American Association for the Advancement of Science; Fellow, American Physical Society; Member, National Academy of Sciences.

March 14, 1991

Plectics

Murray Gell-Mann

Professor of Theoretical Physics, California Institute of Technology; Nobel Laureate, 1969; Dannie Heineman Prize for Mathematical Physics, 1959; E. O. Lawrence Award of the Department of Energy, 1966; Medal of the Franklin Institute, 1967; Fellow, American Physical Society; Member, National Academy of Sciences.

April 11, 1991

Time Reversal, Symmetry, Parity

Norman F. Ramsey, Jr.

Professor of Physics, Harvard University; Nobel Laureate, 1989; E. O. Lawrence Award of the Department of Energy, 1960; Davisson-Germer Prize of the American Physical Society, 1974; President, American Physical Society, 1978-1979; Fellow, American Physical Society; Member, National Academy of Sciences.

April 18, 1991

Note: The Department of Physics is publishing a compilation of these Centennial Colloquia at the request of the American Physical Society. Copies may be obtained by writing to the Department of Physics, ATTN: Publications Office, University of Illinois at Urbana-Champaign, 1110 West Green Street, Urbana, IL 61801.

PHYSICS CENTENNIAL POPULAR LECTURES

In addition to the Centennial Colloquia Series, the Department of Physics also presented an evening series of lectures for the non-scientist, presented by members of the Physics faculty.

Hans Frauenfelder
Professor of Physics
October 29, 1990

Complexity: Where Physics Meets Life

David Pines
Professor of Physics
November 27, 1990

Superfluid Superstars: Pulsars and Other Neutron Stars

Gordon Baym
Professor of Physics
February 5, 1991

The Quark-Gluon Plasma: A New Fundamental Form of Matter

Jim Wolfe
Professor of Physics
March 5, 1991

New Images of Crystals: A View from the Inside,

Peter G. Wolynes
Professor of Physics,
Chemistry, & Biophysics
April 2, 1991

Protein Folding: Can Computers Unscramble Eggs and Crack the Second Half of the Genetic Code?

PHYSICS DEPARTMENT AWARDS AND LECTURES

Scott Anderson Assistant Award

Presented to the outstanding teaching and research assistant each semester.

Centennial Year Recipients: David Humm, Roger Loucks

Ernest M. Lyman Prize

Presented to the outstanding Physics Senior annually.

Centennial Year Recipient: Steven E. Boggs

Laura Eisenstein Award

Presented to the outstanding woman student in Physics annually.

Centennial Year Recipient: Janet D. Finch

Renato Bobone Award

Presented to the outstanding Italian Graduate Student annually.

Centennial Year Recipient: Philippe Monthoux

Felix T. Adler Fellowship

Presented to an outstanding student in Nuclear Physics

Centennial Year Recipient: Sarah Ann Hughes

Jordan S. Asketh Estate Fellowship

Presented to an outstanding student of Greek Citizenship who are graduates of the University of Athens, Greece; the University of Thessaloniki, Greece; or the Polytechnic of Athens, Greece; and who have been recommended by the science faculties of those institutions.

Centennial Year Recipient: Nikolaos Rigakis

William L. McMillan Award & Lecture

Presented to an outstanding young condensed matter physicist within four years of receipt of Ph.D. Winner chosen after an international search.

Centennial Year Recipient: Matthew P. A. Fisher

Peter Axel Memorial Lecture

Presented annually by an outstanding physicist. This lecture series was founded by Peter's colleagues in memory of his many contributions to the department, the University and the field of Physics.

Centennial Year Speaker: Arkady B. Migdal

Gerald M. Almy Memorial Lecture

Presented annually by an outstanding physicist. This lecture series is funded in part by the Gerald M. Almy Memorial Fund of the University of Illinois Foundation.

Series to begin in 1991.

Physics Century II Lecture

Presented annually by an outstanding physicist. This lecture series is funded in part by the Physics Centennial II Colloquia Fund of the University of Illinois Foundation.

Series to begin in 1991.

**UNIVERSITY OF ILLINOIS AND UNIVERSITY OF ILLINOIS FOUNDATION
ENDOWED FUNDS**

BALANCES AS OF 6/30/91

Excellence in Physics	\$335,500.00
Gerald M. Almy Fund	\$ 17,800.00
Ernest M. Lyman Prize Fund	\$ 12,100.00
Scott Anderson Assistant Award Fund	\$ 19,500.00
Laura Eisenstein Award Fund	\$ 16,600.00
William L. McMillan Memorial Award Fund	\$ 45,900.00
Renato Bobone Award Fund	\$ 12,900.00
Felix T. Adler Fellowship	\$ 50,900.00
Jordan S. Asketh Estate Fellowship	\$ 37,700.00
Various Donors - Physics	\$199,800.00
 GRAND TOTAL	 \$748,700.00

FACULTY ADDITIONS SINCE AUGUST 21, 1980

Beck, Douglas
Ceperley, David
Chang, Yia-Chung
Chiang, Tai-Chang
Cooper, S. Lance
Eisenstein, Robert
Errede, Steven
Fradkin, Eduardo
Franklin, Melissa
Gibson, J. Murray
Goldbart, Paul
Goldenfeld, Nigel
Gollin, George
Hertzog, David
Hubler, Alfred
Izen, Joseph
Leggett, Anthony
Liss, Tony
Martin, Richard
Mozurkewich, George
Oono, Yoshitsugu
Packard, Norman
Papanicolas, Costas
Schulten, Klaus
Stone, Michael
Van Harlingen, Dale
Wambach, Jochen
Wiss, James
Wolfram, Stephen
Zabel, Hartmut

**THROUGHOUT THE LOOMIS LABORATORY OF PHYSICS, THE
FOLLOWING PERMANENT DISPLAYS CAN BE FOUND:**

Plaque dedicating the Loomis Laboratory of Physics in honor of F. Wheeler Loomis
September 21, 1977

Scott Anderson Physics Assistant Award Winners

Ernest M. Lyman Prize Winners

Vintage Instructional Laboratory Equipment

Circuit Board from CSX-1 Computer

Display commemorating Dale Gardner, first UI Astronaut in space

Original 24 MeV Betatron designed in 1940 by Donald W. Kerst

Certificate recognizing the Department of Physics' contribution to the restoration and
preservation of the Statue of Liberty

Plaque commemorating the erection of the Physics Building, 1958-1962.

Plaque commemorating the generous contribution from Mrs. Dorothy Talbot Goodell,
University of Illinois Class of 1921, which made possible the landscaping of Loomis
Laboratory of Physics

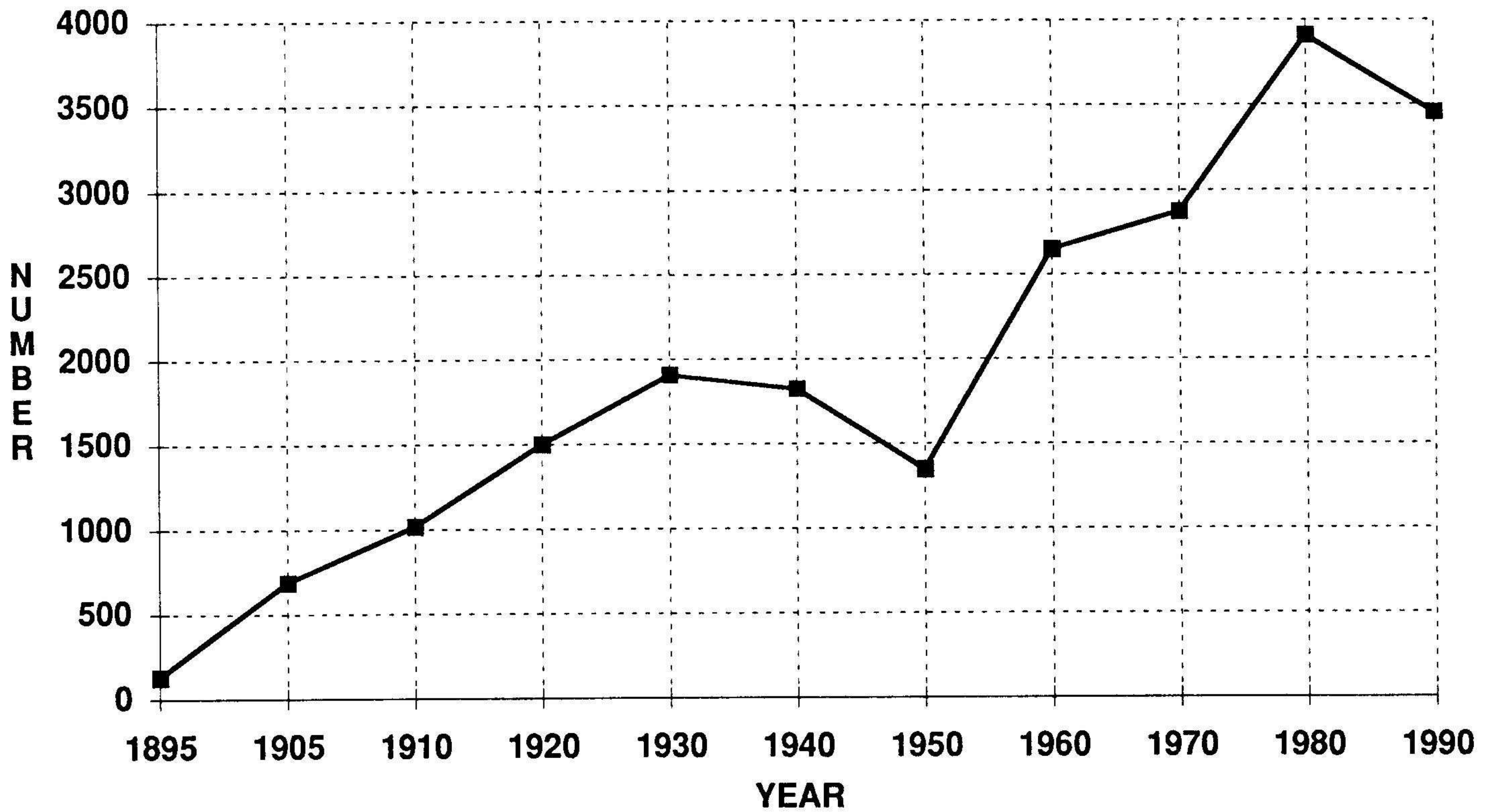
Original Cyclotron built in 1935 by P. Gerald Kruger and G. K. Green

Fermilab Accelerator Magnets -- Main Ring (0.5 TEV) and Tevatron (1.0 TEV)

Cyclotron "DEES" of the University of Illinois Cyclotron Laboratory, circa 1955

Lifesize photograph of the Alvarez 72-inch Hydrogen Bubble Chamber (1959)

PHYSICS ENROLLMENT (UNDERGRADS & GRADS)



PHYSICS DEPARTMENT ENROLLMENT (UNDERGRADS AND GRADS)

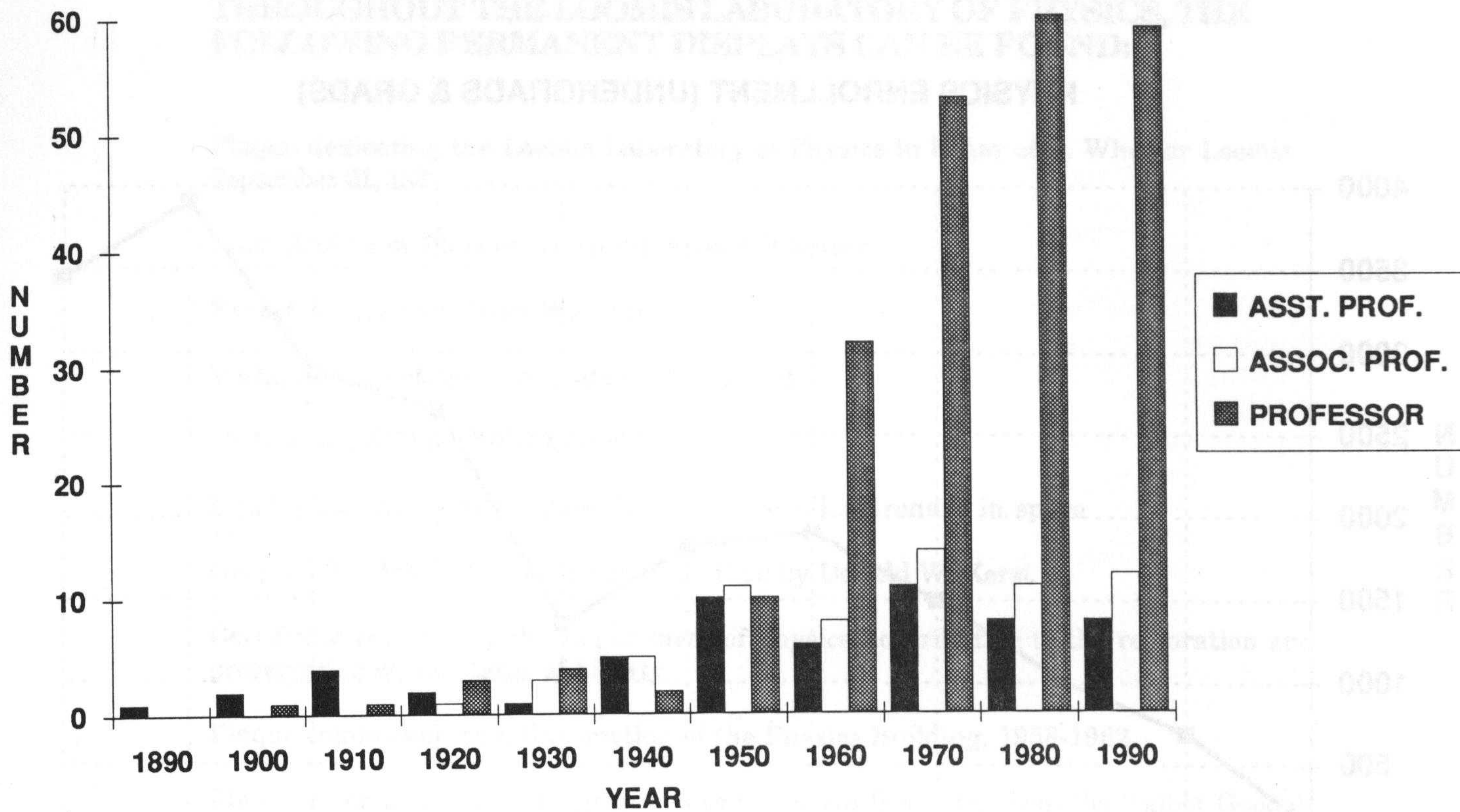
FIGURES AS OF 1ST YEAR OF EACH DECADE

YEAR	TOTAL STUDENTS
1895*	130
1905**	686
1910	1016
1920	1498
1930	1907
1940	1823
1950	1349
1960	2649
1970	2873
1980	3910
1990	3455

* EARLIEST DATE RECORDS AVAILABLE

** RECORDS NOT AVAILABLE 1900-1904

PHYSICS DEPARTMENT FACULTY MEMBERS



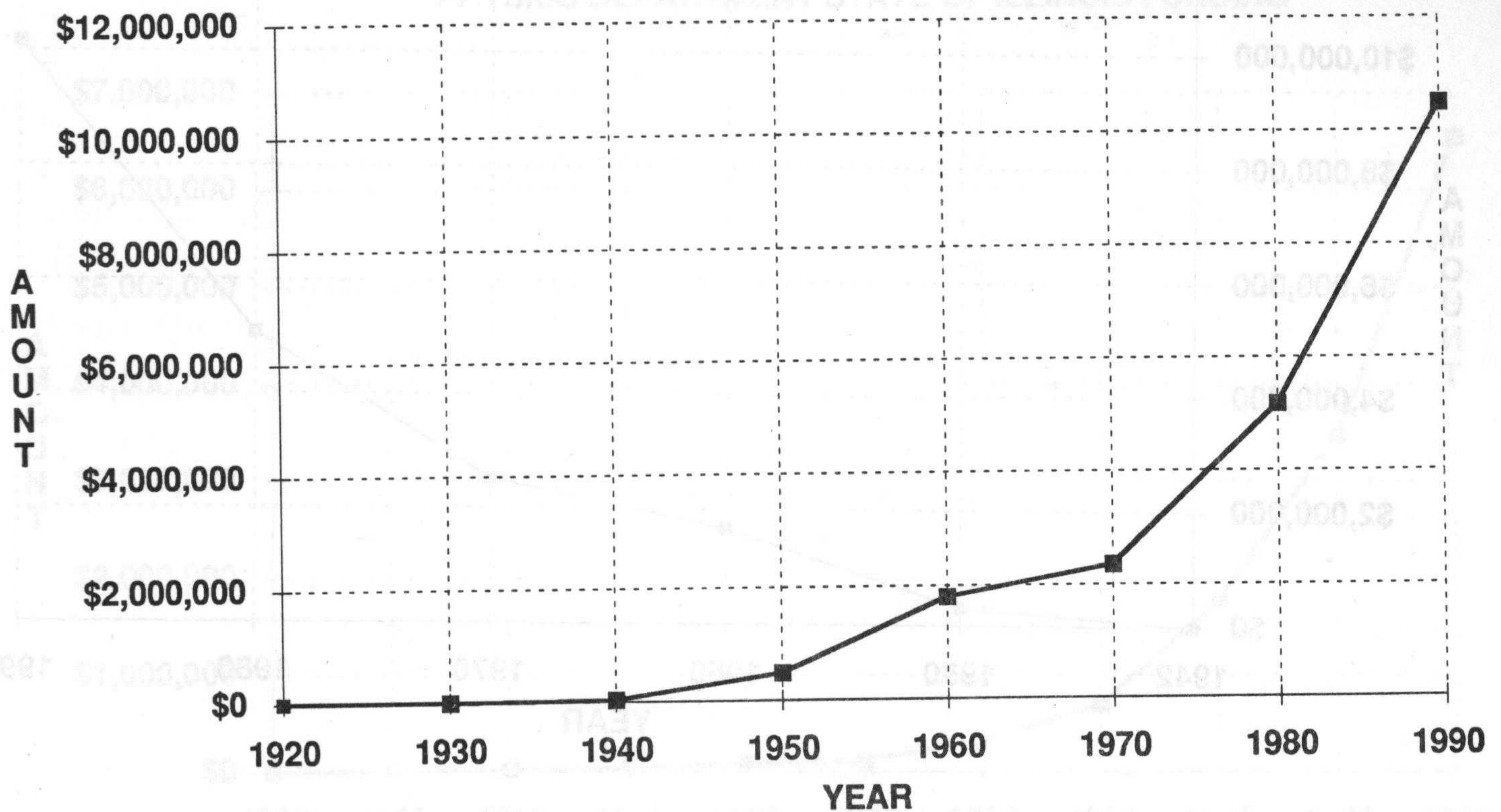
PHYSICS DEPARTMENT FACULTY MEMBERS

FIGURES AS OF 1ST YEAR OF EACH DECADE

	ASST. PROF.	ASSOC. PROF.	PROFESSOR	TOTAL
1890	1	0	0	1
1900	2	0	1	3
1910	4	0	1	5
1920	2	1	3	6
1930	1	3	4	8
1940	5	5	2	12
1950	10	11	10	31
1960	6	8	32	46
1970	11	14	53	78
1980	8	11	60	79
1990	8	12	59	79

Sources: 1890-1980 University of Illinois Catalogs
1990 University of Illinois Board of Trustees Supplement

PHYSICS TOTAL RESEARCH FUNDS (FEDERAL & PRIVATE)



PHYSICS DEPARTMENT TOTAL RESEARCH FUNDS (FEDERAL AND PRIVATE)

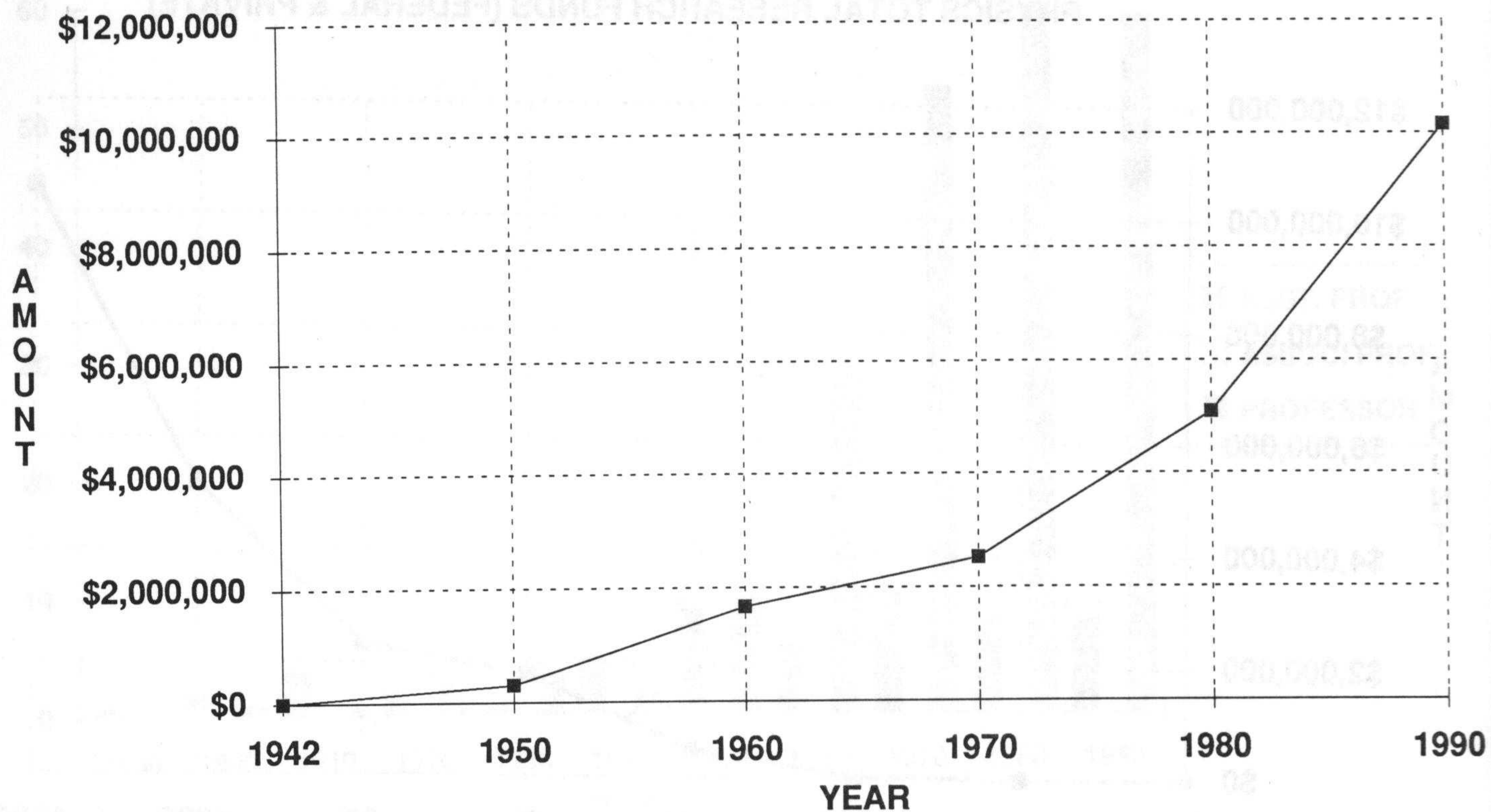
FIGURES AS OF 1ST YEAR OF EACH DECADE

YEAR	AMOUNT
1920	\$639
1930	\$3,644
1940	\$37,196
1950	\$491,210
1960	\$1,796,364
1970	\$2,351,290
1980	\$5,161,501
1990	\$10,469,696

SOURCES: 1920 - 1980: COMPTROLLER REPORTS
1990: PHYSICS DEPARTMENT BUSINESS OFFICE

Little money was spent on research before 1920. Amounts listed before 1990 are expenditures. The 1990 total is the amount received.

U. S. FEDERALLY SPONSORED GRANTS & CONTRACTS FUNDS



U. S. FEDERALLY SPONSORED GRANTS CONTRACTS FUNDS

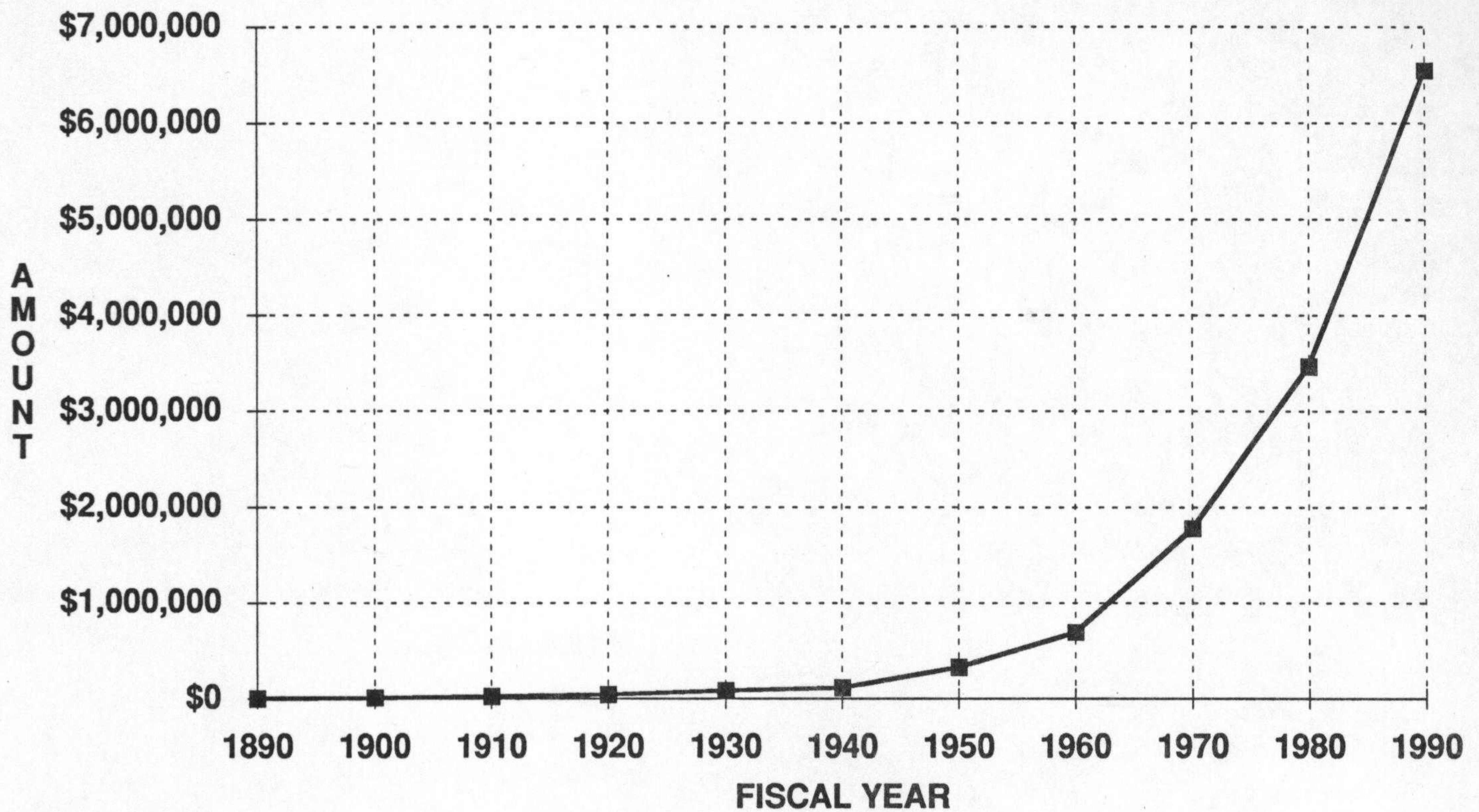
DECADE	AMOUNT
1942-1949*	\$933,732
1950-1959	\$5,728,436
1960-1969	\$26,484,118
1970-1979	\$28,504,912
1980-1989	\$80,283,205
1990-1991**	\$19,749,515
TOTAL	\$161,683,919

* RECORDS BEGIN IN 1942 RESULTING IN FIGURES FOR PARTIAL DECADE

** RECORDS END IN 1991 RESULTING IN FIGURES FOR PARTIAL DECADE

SOURCES: 1942-1981 COMPTROLLER REPORTS (EXPENDITURES)
1982-1991 PHYSICS DEPARTMENT BUSINESS OFFICE (AMOUNTS RECEIVED)

PHYSICS DEPARTMENT STATE OF ILLINOIS FUNDING



PHYSICS DEPARTMENT STATE OF ILLINOIS FUNDING

FIGURES AS OF 1ST YEAR OF EACH DECADE

July 1 Fiscal Year	Amount
1890	\$2,365
1900	\$7,075
1910	\$24,003
1920	\$44,203
1930	\$81,777
1940	\$110,688
1950	\$323,796
1960	\$682,826
1970	\$1,774,503
1980	\$3,462,198
1990	\$6,547,114

SOURCES: 1890-1910 U. OF I. BOARD OF TRUSTEES REPORTS
 1920-1980 U. OF I. COMPTROLLER REPORTS
 1990 PHYSICS DEPARTMENT BUSINESS OFFICE